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LICK OBSERVATORY.
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ANNALS

OF THE

CAPE OBSERVATORY.

VOLUME VI.

LICK OBSERVATORY
UNIVERSITY
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A

DETERMINATION OF THE SOLAR PARALLAX

AND

MASS OF THE MOON,

FROM

HELIOMETER OBSERVATIONS

OF THE MINOR PLANETS

IRIS, VICTORIA AND SAPPHO

MADE IN THE YEARS

1888 and 1889

AT THE

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

IN CO-OPERATION WITH THE OBSERVATORIES OF

YALE COLLEGE (Newhaven), LEIPZIG, GÖTTINGEN, BAMBERG AND OXFORD (Radcliffe),

AND FROM

MERIDIAN OBSERVATIONS MADE AT ALL THE PRINCIPAL OBSERVATORIES,

PLANNED AND DISCUSSED BY

DAVID GILL, C.B., LL.D., F.R.S.
HER MAJESTY'S ASTRONOMER AT THE CAPE,

WITH THE CO-OPERATION OF

ARTHUR AUWERS, PH.D., BERLIN, AND W. L. ELKIN, PH.D., YALE UNIVERSITY OBSERVATORY.

VOLUME I.

A 13424. (a 2)

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PREFACE.

The following work is the outcome of co-operation on part of many astronomers and many observatories, to determine some of the fundamental constants of astronomy with a higher accuracy than had hitherto been attained. The wide-felt scientific need of such an undertaking may be assumed to be demonstrated by the fact that almost every astronomer who was appealed to entered with heart and soul into his allotted share of the work, and probably no similar astronomical undertaking has ever before received such universal and powerful co-operation. Such co-operation proves, if proof is necessary, that science knows no nationality, and that the common pursuit of truth for truth's sake affords "one touch of nature" which "makes the whole world kin."

The ultimate form which the publication has assumed is very different from that which was originally intended. It was at first arranged that Dr. Elkin should discuss the Heliometer observations of *Iris*, and publish his work in the Annals of the Yale Observatory; that Dr. Gill should undertake the reduction of the Heliometer observations of *Victoria* and *Sappho*, and publish his discussion in the Annals of the Cape Observatory, and that Dr. Auwers should discuss and publish independently the Meridian observations of the comparison stars. Dr. Auwers, however, extended his work to a discussion of the Meridian observations for parallax; and, before the definitive arrangement was made, Dr. Elkin had already independently discussed the places of the *Iris* comparison stars from the Meridian observations. As the various investigations approached completion and the mutual independence of the discussions became more evident, it appeared preferable that the work should be issued in one publication, concluding with a summary and general discussion of the whole. Dr. Auwers and Dr. Elkin cordially agreed that the whole should be published in the Annals of the Cape Observatory, with the result that, through the liberality of the Lords Commissioners of the Admiralty, the work appears in its present form.

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ERRATA.

VOL. I., PARTS 1 & 2.

Page 11. Line 7, *for* $-_3$ *read* Σ_3.

" 47. In pair No. 47, *for* pair *n l read n i*.

" 224. Last line, *for* $-\overset{2}{x}$ *read* $\varepsilon\overset{2}{x}$.

Pages 325, 327, 329, 331, 333, 335, 337. The headings of columns 4 and 5 should be ″ *not* r.

Page 500. Line 24, *after* "determination of" *add a*.

" 536. Line 9 from bottom of page, *for* $\kappa = \kappa_0 (1\frac{1}{10} + \mu')$ *read* $\kappa = \kappa_0 (1 + \frac{1}{10}\mu')$.

VOL. II., PART 1.

DESCRIPTION OF INSTRUMENTS, &c.

Page 14. Line 18, *for* "is fixed on" *read* "rotates with."

" 60. Line 27, *after* "was adopted" *add* "by both observers."

OBSERVATIONS.

Page 14. (117*). Cape Sid. Time, *insert* $16^{h.}\ 49^{m.}\ 29^{s}\cdot 8$ *above the figures* $4904^{s}\cdot 232$.

" 62. (549). P. Angle, *for* 257° 6′ 51″ *read* 257° 6′ 21″.

" 72. (641). P. Angle, *for* 62° 34′ 47″ *read* 62° 32′ 47″.

" 123. (340p). Mean, *for* 17° 11′ 57″ *read* 7° 11′ 57.

" 137. (638p). Mean, *for* 151° 49′ 34″ *read* 351° 49′ 34″.

" 237. In column "Means," obs. (57), *for* $406^{r}\cdot 102$ *read* $407^{r}\cdot 102$.

" 241. *Insert* note—"In the numbering (134) was inadvertently omitted.

" 247. In column "Means," obs. (251), *for* 446·655 *read* 447·655.

" 252. In column "Means," obs. (328), *for* 324·218 *read* 325·218.

Dots denoting that the printed figures are 0·5 too small are omitted in the following Yale observations :—

Page 108. Columns 4 and 8, the Mean Readings, Nos. (3), (5), (6), (7), (8), (9), (10), (11).

" 109. Column 3, the 2nd Micrometer Readings, (20p) $17^{h.}\ 28^{m.}\ 1^{s.}$; $29^{m.}\ 28^{s.}$; $32^{m.}\ 7^{s.}$ (24p) $17^{h.}\ 46^{m.}\ 34^{s.}$

Column 4, the Mean of Times, (26p) and (28p). The Mean Readings, ($21^{s.}$) and ($25^{s.}$).

Column 7, 1st Micrometer Readings, (33p) $19^{h.}\ 3^{m.}\ 6^{s.}$ (35p) $19^{h.}\ 19^{m.}\ 46^{s.}$ (37p) $19^{h.}\ 24^{m.}\ 58^{s.}$ (41p) $19^{h.}\ 45^{m.}\ 59^{s.}$; $49^{m.}\ 59^{s.}$; $51^{m.}\ 21^{s.}$ 2nd Micrometer Readings, (33p) $19^{h.}\ 3^{m.}\ 6^{s.}$; $6^{m.}\ 56^{s.}$ (35p) $19^{h.}\ 19^{m.}\ 46^{s.}$; $21^{m.}\ 7^{s.}$ (37p) $19^{h.}\ 29^{m.}\ 37^{s.}$; $31^{m.}\ 32^{s.}$ (39p) $19^{h.}\ 42^{m.}\ 45^{s.}$ (43p) $19^{h.}\ 58^{m.}\ 25^{s.}$

Page 110. Column 3, 1st Micrometer Readings, (47p) $17^{h.}\ 25^{m.}\ 50^{s.}$ (49p) $17^{h.}\ 34^{m.}\ 40^{s.}$ 2nd Micrometer Readings, (47p) $17^{h.}\ 27^{m.}\ 18^{s.}$ (49p) $17^{h.}\ 34^{m.}\ 40^{s.}$ (51p) $17^{h.}\ 41^{m.}\ 36^{s.}$; $43^{m.}\ 5^{s.}$ (53p) $17^{h.}\ 46^{m.}\ 19^{s.}$; $48^{m.}\ 49^{s.}$; $50^{m.}\ 17\cdot$

Column 7, 1st Micrometer Readings, (55p) $17^{h.}\ 56^{m.}\ 28^{s.}$ (57p) $18^{h.}\ 3^{m.}\ 49^{s.}$ (61p) $18^{h.}\ 13^{m.}\ 6^{s.}$; $14^{m.}\ 18^{s.}$; $14^{m.}\ 58^{s.}$; $15^{m.}\ 56^{s.}$ (63p) $18^{h.}\ 27^{m.}\ 17^{s.}$ 2nd Micrometer Readings, (57p) $18^{h.}\ 0^{m.}\ 23^{s.}$; $1^{m.}\ 56^{s.}$; $3^{m.}\ 49^{s.}$ (61p) $18^{h.}\ 14^{m.}\ 18^{s.}$ (63p) $18^{h.}\ 27^{m.}\ 17^{s.}$

Column 8, Mean Readings, ($56^{s.}$), ($58^{s.}$).

Page 111. Column 3, 1st Micrometer Readings, (65p) $18^{h.}\ 46^{m.}\ 11^{s.}$ (67p) $18^{h.}\ 59^{m.}\ 25^{s.}$ (69p) $19^{h.}\ 21^{m.}\ 11^{s.}$ (71p) $18^{h'}\ 22^{m.}\ 57^{s.}$

Column 4, Mean Reading ($66^{s.}$).

Column 7, 1st Micrometer Reading, (83p) $19^{h.}\ 2^{m.}\ 32^{s.}$ 2nd Micrometer Readings, (77p) $18^{h.}\ 47^{m.}\ 33^{s.}$; $48^{m.}\ 21^{s.}$; $49^{m.}\ 31^{s.}$ (83p) $19^{h.}\ 2^{m.}\ 32^{s.}$ (85p) $19^{h.}\ 6^{m.}\ 0^{s.}$ (87p) $19^{h.}\ 8^{m.}\ 7^{s.}$; $9^{m.}\ 52^{s.}$

Page 112. Column 3, 1st Micrometer Reading, (93p) $21^{h.}\ 9^{m.}\ 1^{s.}$ (95p) $21^{h.}\ 16^{m.}\ 23^{s.}$ 2nd Micrometer Reading, (95p) $21^{h.}\ 20^{m.}\ 14^{s.}$ —Both Micrometer Readings, (93p) $21^{h.}\ 2^{m.}\ 52^{s.}$ (95p) $21^{h.}\ 19^{m.}\ 1^{s.}$ (97p) $21^{h.}\ 25^{m.}\ 43^{s.}$ (99p) $21^{h.}\ 33^{m.}\ 27^{s.}$

VOL II., PART 2.

Page 467. Right hand column, *for* $m =$ *read* $m = \theta$ Arietis.

" " *for* $o = \theta$ Arietis *read* o.

" 692. R.A. of Star C, *for* $21^{s}\cdot 176$ *read* $2^{s}\cdot 176$.

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DETERMINATION OF THE SOLAR PARALLAX, &c.

VOL. I., PARTS 1, 2 & 3.

DISCUSSION OF THE TRIANGULATION

OF THE

VICTORIA COMPARISON STARS,

AND THE

HELIOMETER OBSERVATIONS

OF

VICTORIA AND SAPPHO,

BY

DAVID GILL.

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INTRODUCTION TO PARTS 1, 2 AND 3.

Professor Galle, of Breslau, was the first astronomer to propose the observation of minor planets as a valuable method for determining the Solar Parallax (*Ast. Nach.*, Vol. LXXX., No. 1897). In compliance with his request observations of the difference of Declination of *Flora* from selected comparison stars were made at various observatories in both hemispheres during the favourable opposition of the planet in October and November 1873, and the results have been discussed and published by him (*Ueber eine Bestimmung der Sonnen - Parallaxe aus corresponderenden Beobachtungen des Planaten Flora* . . . 8° Breslau 1875). The accuracy of the actual observations left much to be desired, not from any defect in Galle's method, but chiefly because some of the equatorials employed were not sufficiently stable in Declination, and some of the micrometers were not in first rate condition.

In conjunction with the expedition of Lord Lindsay (now the Earl of Crawford and Balcarres) to the island of Mauritius in 1874, I made a series of observations of the minor planet *Juno*, of which an account is published in Vol. II. of the Dun Echt Observatory publications. From unexpected delay in the arrival of the yacht and instruments, it was impossible to commence observations until a week after opposition, consequently barely one third of the anticipated number of measures could be secured, and these in circumstances not the most favourable in regard to parallax factor. The results therefore were not calculated to afford a very definitive value of the Solar Parallax, but they were absolutely conclusive as to the great capabilities of the method. In the Mauritius observations of *Juno* a heliometer was employed in lieu of the ordinary equatorial and filar micrometer, and the distances and position angles of the planet from suitable comparison stars were measured instead of differences of Declination. The observations were made east and west of the meridian, so that a complete determination of the parallax could be obtained by a single observer at a single station, without the co-operation of observers in another hemisphere. The heliometer-method has the great advantage of being independent of the stability of the stand, and it allows a better selection of comparison stars because measures can be made by it of much larger angles than the limited field of the filar micrometer permits.

But such observations as Brünnow's researches on the parallax of the star 1830 Groombridge (Dunsink Observations, 2nd part, pp. 1–25, Dublin 1875) prove conclusively that the original method proposed by Galle is capable of very great precision, provided that equally suitable instruments with the Dunsink equatorial, and observers as skilled as Brünnow were available in both hemispheres. It seemed

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therefore desirable to give the method a fuller trial. Accordingly I prepared a programme for observations of *Victoria* and *Sappho* during the opposition of 1882, in which a number of observatories co-operated. In the programme in question I suggested the use of the driving clock so as to permit a number of bisections to be made, first of the preceding star, then of the planet, and finally of the following star. Unfortunately experience has now proved that there were very few equatorials at the time capable of preserving their instrumental declination with any approach to the necessary precision, that frequently the mere reversal of the direction of the slow motion in Right Ascension caused a sensible change in the instrumental declination (apparently due to imperfection in the fit of the lower pivot of the polar axis in its bearing, as well as other mechanical defects of construction); and besides, in hardly any instance, were the equatorial adjustments determined with the precision necessary to compute the corrections which are applicable when the star and planet are not observed at identical hour angles.

The usual method of measuring differences of Declination, which was adopted in Galle's plan and employed by Brünnow (*loc. cit.*), is entirely free from these defects, and I regret that, in the hope of shortening the labour and increasing the accuracy of the result, I was led to suggest a new departure without sufficient experience of the defects of many existing instruments. After expending considerable time in discussing some of the observations, I came reluctantly to the conclusion that the results obtained were not only insufficiently accordant *inter se*, but were liable to considerable possibility of systematic error, and that it would be safer and better to obtain a new series of observations, than to complete the reduction of a series which was seen, at an early stage of the work, to be unreliable within the necessary limits of precision.

Looking forward to the available opportunities for determining the Solar Parallax by observations of minor planets, it was found that *Iris* in 1888 and *Victoria* and *Sappho* in 1889 would be exceptionally favourably situated for the purpose. For reasons which are afterwards made more evident, it seemed best to confine the programme to Heliometer work. In such work I was assured of the co-operation of Dr. Elkin, at Yale, with the fine Heliometer belonging to that observatory, and indeed the original idea was to limit the scheme to such a programme as we could jointly undertake.

In 1884 I proposed to the Lords Commissioners of the Admiralty the construction of a Heliometer of 7 inches aperture for the execution of this work, and for the continuance of previous researches on Stellar Parallax. Their Lordships promptly and liberally responded to this request. In April 1887 the instrument was inspected by me at Messrs. Repsold's workshops in Hamburg, a few months later in the same

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year it was erected and in use at the Cape, and meanwhile very similar Heliometers were completed or under construction for the observatories of Leipzig, Göttingen, and Bamberg; thus, thanks to the good will of their Directors, it became possible to secure their co-operation. It was also arranged that Dr. Elkin should undertake the discussion of the *Iris* observations; Parts 1, 2 and 3 of the present work, therefore, have reference solely to the observations of *Victoria* and *Sappho*.

The employment of the diurnal method was at first seriously considered. This method has certain advantages, such, for example, as the elimination to a large extent of personal systematic errors depending on the distance observed. But this elimination is only available when the same stars are observed both E. and W. of the meridian on the same night, and when the parallax is derived only from combinations limited to these conditions. Experience shows that such limitation always excludes a considerable number of the actual observations obtained, and thus to secure sufficient material for a good determination of the Solar Parallax it would be necessary to occupy a station near the equator during the oppositions of several favourably situated planets. Apart from the fact that other official duties rendered my absence from the Cape for so long a period practically impossible, the transport of so heavy and complicated an instrument as a large modern Heliometer and its erection on an isolated station (such as the islands of Ascension, Java or the Seychelles) involves risks and costs not to be lightly undertaken. Besides, it is barely possible to carry out a long series of observations, demanding the highest refinement, without some approximation to the facilities and adjuncts of a fixed observatory, the highest accuracy of hand and eye being only attainable in conditions of comparative physical comfort and in the absence of all other anxiety and nervous strain. It was therefore necessary to devise methods depending on the employment of Heliometers in opposite hemispheres, and in which provision should be made for the complete determination and elimination of every preconceivable form of systematic error. The programme for observation of *Iris* in 1888 was originally planned for execution at New Haven and the Cape only, the co-operation of the Heliometers at Leipzig and Oxford (Radcliffe) was only secured very shortly before the actual observations were commenced.

After experience of the *Iris*-observations, the following programmes for the observation of *Victoria* and *Sappho*, at opposition in 1889, were printed and circulated.

Programme for Observation of the Minor Planet "Victoria."

The following programme has been prepared for observation of the minor planet *Victoria* at its opposition in 1889:

The primary object is to determine the Solar parallax from Heliometer Observations made in both Hemispheres.

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For this purpose the comparison stars are, as far as possible, selected so that when the planet is situated at the greatest zenith distance at which good observations can be made (that is, when the parallax factor is the largest attainable), the two comparison stars shall be situated one above and one below the planet. In this way the determination of the parallax is made to rest upon the most accurate method of observation at present known to Astronomers, viz., upon measures with the Heliometer of the *difference* of two nearly equal and opposite distances.

Let s and p be respectively the distance and position angle of a star reckoned from the planet.
and q the parallactic angle for declination δ, hour angle t, and latitude ϕ.

The relations of these quantities for available observatories are for *Victoria* ($\delta - 6°$)

t	Cape. $\phi - 33°56'$		European Observatories. $\phi + 51°$		New Haven. $\phi + 41°19'$	
	q	ζ	q	ζ	q	ζ
h m	°	°	°	°	°	°
+ 0 0	180·0	27·9	0·0	57·0	0·0	47·3
0 30	167·0	28·8	5·6	57·4	7·6	47·8
1 0	155·5	31·2	11·0	58·5	14·9	49·3
1 30	146·2	34·8	16·1	60·2	21·5	51·6
2 0	139·2	39·3	20·8	62·6	27·4	54·7
2 30	133·9	44·6	24·9	65·5	32·5	58·4
3 0	130·1	50·1	28·5	68·8	36·7	62·7
3 30	127·3	55·9	.....	.....	40·2	67·3
4 0	125·5	61·9	.....	.....	43·1	72·3
4 30	124·3	68·0	.....	.....	.....	.....
+ 5 0	123·6	74·2	.....	.....	.....	.....

In order that the parallactic displacement may take place in the direction of the line joining star and planet, the comparison stars must be selected so that $p = q$ or $q + 180°$. But q is positive for Western and negative for Eastern hour angles in the Northern Hemisphere and *vice versâ* for $(180° + q)$ in the Southern Hemisphere. Therefore, in order that $(p - q)$ may be as nearly as possible $= 0°$ or $180°$, the stars which are to be observed with the planet East of the Meridian in the Northern Hemisphere must be observed West of the Meridian in the Southern Hemisphere, and *vice versâ*.

Stars symmetrically situated with respect to the planet cannot always be found precisely in the required position angle, and therefore the available parallactic displacement becomes P. cos $(p = q)$.

Further, in the Northern Hemisphere the available opportunities of measurement are limited by twilight. If we assume that observations cannot be made when the sun is less than 7° below the horizon, we have the following limits of hour angle during which observations of *Victoria* may be made.

1889.	Europe.		New Haven.	
	h m	h m	h m	h m
June 10	− 5 30	to + 0 3	− 5 40	to + 0 59
20	− 4 52	to + 0 40	− 5 40	to + 1 39
30	− 4 10	to + 1 28	− 5 7	to + 2 25
July 10	− 3 33	to + 2 23	− 4 26	to + 3 16
20	− 2 58	to + 3 24	− 3 46	to + 4 12
30	− 2 28	to + 4 28	− 3 9	to + 5 10
Aug. 9	− 2 1	to + 5 30	− 2 36	to + 5 40
19	− 1 40	to + 5 30	− 2 8	to + 5 40
29	− 1 21	to + 5 30	− 1 43	to + 5 40

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Thus, in the beginning of the series, observations W. of the Meridian cannot be made in the N. Hemisphere at any considerable hour angle; and, towards the close of the series, they can only be made at small hour angles E. of the Meridian. On account of the Sun's Northern declination no such limits are imposed on observations at the Cape.

In order to facilitate the selection of the most suitable stars, and to permit the selection of the most suitable hour angles of observation, the following tables of parallax factors have been computed for the co-operating observatories.

To find the factor in position angle the argument of p is to be taken $(90° - p)$.

TABLE OF PARALLAX FACTORS [$= \sin \zeta \cos (p - q)$].

Cape ($\phi = -33° 56'$).

t h	m	$p =$ 0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	ζ °
0	0	·47	·46	·44	·41	·36	·30	·23	·16	·08	·00	27·9
0	30	·47	·48	·48	·46	·43	·39	·33	·26	·19	·11	28·8
1	0	·47	·50	·52	·52	·50	·48	·42	·36	·29	·21	31·2
1	30	·47	·52	·55	·57	·57	·55	·51	·46	·40	·32	34·8
2	0	·48	·53	·58	·62	·63	·63	·60	·56	·50	·43	39·3
2	30	·49	·58	·63	·67	·70	·70	·68	·64	·58	·51	44·6
3	0	·49	·59	·66	·72	·76	·77	·75	·72	·66	·59	50·1
3	30	·50	·61	·70	·76	·81	·83	·82	·79	·74	·66	55·9
4	0	·51	·63	·73	·80	·85	·88	·88	·86	·80	·72	61·9
4	30	·52	·65	·75	·84	·89	·92	·92	·90	·84	·77	68·0
5	0	·53	·66	·77	·86	·92	·96	·96	·94	·88	·80	74·2

European Observatories ($\phi = +51°$).

0	0	·84	·83	·79	·73	·64	·54	·42	·29	·15	·00	57·0
0	30	·84	·84	·82	·77	·70	·60	·49	·36	·23	·08	57·4
1	0	·84	·85	·84	·81	·75	·66	·56	·44	·31	·16	58·5
1	30	·83	·86	·87	·84	·79	·72	·62	·51	·38	·24	60·2
2	0	·83	·87	·89	88	·84	·79	·69	·58	·45	·32	62·6
2	30	·82	·88	·91	·91	·88	·82	·74	·64	·52	·38	65·5
3	0	·82	·88	·92	·93	·91	·87	·79	·70	·58	·44	68·8

New Haven ($\phi = +41° 19'$).

0	0	·74	·72	·69	·64	·56	·47	·37	·25	·13	·00	47·3
0	30	·73	·74	·72	·68	·63	·55	·45	·34	·22	·13	47·8
1	0	·73	·75	·75	·73	·69	·62	·53	·43	·32	·19	49·3
1	30	·73	·77	·78	·77	·74	·69	·61	·52	·41	·29	51·6
2	0	·73	·78	·81	·82	·80	·75	·69	·60	·50	·38	54·7
2	30	·72	·79	·83	·85	·84	·81	·76	·68	·58	·46	58·4
3	0	·71	·79	·85	·88	·89	·86	·82	·75	·65	·53	62·7
3	30	·70	·79	·87	·91	·92	·91	·87	·80	·71	·59	67·3
4	0	·70	·80	·88	·93	·95	·95	·91	·85	·76	·65	72·3

Experience has shown that, for the investigation of planetary parallax, a mean zenith distance of about 60° is the most favourable, since it affords, on the one hand, a sufficiently large parallax

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factor, and, on the other, avoids uncertainties due to irregular refraction and bad definition which are inseparable from observations at very great zenith distances.

At $t = 4^h$ for the Cape, 2^h for European Observatories, and 3^h for New Haven, *Victoria* has a zenith distance of 62°.

The corresponding combined factors are

	$p = 10°$	20°	30°	40°	50°	60°	ζ	t
Cape and Europe	1·50	1·62	1·68	1·69	1·67	1·57	62°	4^h & 2^h
Cape and New Haven	1·62	1·58	1·68	1·74	1·74	1·70	62	4 & 3

The most favourable position angles are $p = 39°$ for the Cape with European Observatories, and 46° for the Cape and New Haven.

But, on account of twilight, it will only be possible in Europe to make complete sets of observations at a mean hour angle of 2^h both E. and W. of the Meridian from July 10 to July 30, and for a still shorter time at New Haven at 3^h hour angle.

In the beginning of the series no observations will be possible W. of the Meridian in Europe, and it is not proposed to begin such observations till June 26, when the observations may be made in Europe at a mean hour angle of $0^h\ 30^m$, and at New Haven of 1^h. The factors for these conditions are:

$p =$	10°	20°	30°	40°	50°	60°	ζ	t
Cape and Europe	1·47	1·55	1·57	1·55	1·48	1·37	61° 9 & 57° 4	4^h & $0^h\ 30^m$
Cape and New Haven ...	1·24	1·38	1·48	1·53	1·50	1·41	61° 9 & 49° 3	4^h & $1^h\ 0^m$

The most favourable position angles are therefore about 28° for the Cape and Europe, and 42° for the Cape and New Haven.

Thus, practically, the most useful value of p is 40°, in other words the comparison stars should be selected in position angle relative to the planet as follows:

For observations W. of Meridian N. Hemisphere
" E. " S. " } $p =$ 40° & 220°

For observations E. of Meridian N. Hemisphere
" W. " S. " } $p =$ 320° & 140°

the inclination to the Meridian in the selection being increased rather than diminished when measures can be made at large hour angles in both Hemispheres, and diminished rather than increased when, on account of twilight, the measures in the Northern Hemisphere can only be made at small hour angles.

When favourable comparison stars can be found very near the planet, the full parallax factor due to zenith distance may be obtained by measures both of position angle and distance. In this case, if only one comparison star is observed, it is necessary to measure also a standard pair of stars to determine the zero of the position circle and the scale value.

The observer may augment the available factor by noting whether the inclination of the line joining the planet and star to the vertical increases or diminishes with the time. In the former case he should first observe distances and then position angles, and in the second case observe first position angles and then distances. In some cases it will be best to measure distances only East of the Meridian and position angles only W. of it, or *vice versâ*; this will always be the proper course when $p = \pm 35°$ to $\pm 55°$ and at the same time considerable hour angles E. and W. of the Meridian are available.

In selecting comparison stars there has been further kept in view the desirability of employing the same comparison stars for several successive nights, and of reducing their total number to a

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minimum, so as to render it possible to determine the places of all of them by Meridian observations at each of a number of different Observatories.

As a furthur control on the results of the Meridian observations and of the observations with the Heliometer, all Observatories which are in a position to make photographic observations of the planet and neighbouring stars are earnestly requested to co-operate.

The programmes for the Heliometric, Photographic and Meridian Observatories are attached.

DAVID GILL.

Royal Observatory, Cape of Good Hope,
1889 *April* 17.

Programme for Heliometer Observations.

1889.	°	*t* E. in N. Hemisphere / W. in S. „	*t* W. in N. Hemisphere / E. in S. „
June 10	— 8·5237	For the purpose of determining the tabular errors, measure position angles also at any convenient hour angle, reserving most favourable hour angle for measures of distance, as parallax depends on distances.	
	— 9·5382		
11	— 8·5237		
	— 9·5382		
12	— 7·5169		
	— 9·5382		
13	— 7·5169		
	— 9·5382		
14	— 7·5169		
	— 9·5382		
15	— 7·5169		
	— 9·5382		
16	— 7·5169		
	— 9·5382		
17	— 6·5360		
	— 9·5382		
18	— 6·5360		
	— 9·5382		
19	— 7·5169	Parallax to depend on measures of distance, measure *p* at any convenient hour angle, but measure Standard stars in middle of measures of distance.	
20	— 7·5169	Measure *s* and *p* and Standard stars before and after.	
21	— 7·5169	Do.	do.
22	— 7·5169	Do.	do.
23	— 6·5360	Do.	do.
24	— 6·5360	Parallax depends on *p*, measure *s* at any convenient *t*.	
25	— 6·5360	Measure *s* and *p*, Standard stars before and after.	
26	— 5·5138	*s* only	— 4·5016 *s* only
	— 7·5169		— 8·5205
27	— 5·5138	Do.	— 4·5016 Do.
	— 7·5169		— 8·5205
28	— 4·4992	Do.	— 5·5144 Do. near Meridian
	— 7·5169		— 8·5205
29	— 4·4992	Do.	— 5·5144 Do. near Meridian
	— 7·5169		— 8·5205

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1889.	*t* E. in N. Hemisphere W. in S. "		*t* W. in N. Hemisphere E. in S. "		
	°		°		
June 30	— 5·5120 — 6·5360	*s* only	— 5·5138 — 6·5339	*s* only, near Meridian.	
July 1	— 5·5120 — 6·5360	Do.	— 5·5138 — 6·5339	Do.	
** 2	— 5·5120 — 6·5360	Do.	— 5·5144 — 6·5320	*s* only	
3	— 4·4984 — 6·5339	Do.	— 5·5144 — 6·5320	Do.	
4	— 4·4984 — 6·5339	Do.	— 4·4992 — 6·5320	Do.	
5	— 5·5124	*p* & *s*	— 5·5124	*s* & *p*	Also Standard stars E. & W., *s* & *p*.
6	— 5·5124	*s* & *p*	— 5·5124	*s* & *p*	Distance so small that Standard stars may be omitted.
7	— 5·5124	*s* & *p*	— 5·5124	*p* & *s*	Also Standard stars E. & W., *s* & *p*.
8	— 5·5120 — 5·5124 — 5·5099	*s* only from each	— 5·5120 — 5·5124 — 5·5099	*s* only from each	
9	— 5·5120 — 5·5099	*p* only	— 5·5120 — 5·5099	*s* only	
10	— 5·5099	*p* only	— 5·5099	*s* only	With corresponding obs. of Standard stars
11	— 4·4960 — 5·5099	*s* only	— 4·4960 — 5·5099	*p* only	
12	— 4·4960	*s* & *p*	— 4·4960	*p* & *s*	With corresponding obs. of Standard stars
13	— 4·4960 — 5·5075	*p* & *s*	— 4·4960 — 5·5075	*p* & *s*	
14	— 4·4960 — 5·5075	*p* & *s*	— 4·4960 — 5·5075	*p* & *s*	
15	— 5·5075	*p* & *s*	— 5·5075	*p* & *s*	With corresponding obs. of Standard stars
16	— 4·4936	*p* & *s*	— 4·4936	*p* & *s*	Do.
17	— 4·4926	*p* & *s*	— 4·4926	*p* & *s*	Do.
18	— 4·4926	*p* & *s*	— 4·4926	*p* & *s*	Do.
19	— 4·4926 — 4·4903	*p* & *s*	— 4·4926 — 4·4903	*p* & *s*	
20	— 4·4903	*p* & *s*	— 4·4903	*p* & *s*	With corresponding obs. of Standard stars
21	— 4·4903	*p* only	— 4·4903	*s* only	Do.
22	— 4·4903	*s* only	— 4·4903	*p* only	Do.
23	— 4·4883 — 4·4903	*s* & *p*	— 4·4916 — 5·5036	*s* only	
24	— 4·4883 — 4·4903	*s* & *p*	— 4·4916 — 5·5036	*s* only	
25	— 4·4883	*s* only	— 4·4883	*p* only	With corresponding obs. of Standard stars
26	— 4·4883	*p* only	— 4·4883	*s* only	Do.
27	— 4·4883	*s* & *p*	— 4·4883	*s* & *p*	Do.
28	— 4·4883 — 4·4861	*s* & *p*	— 4·4883 — 4·4861	*s* & *p*	
29	— 3·4649 — 5·5036	*s* only	— 4·4877 — 4·4861	*s* only	

** July 2.—The stars originally proposed were — 4°·4984 and — 6°·5339 instead of — 5°·5120 and 6°·5360 now adopted.

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1889.	*t* E. in N. Hemisphere W. in S. °		*t* W. in N. Hemisphere E. in S. °		
July 30	— 3·4649 — 5·5036	*s* only	— 4·4877 — 4·4861	*s* only	
31	— 4·4861	*s* & *p*	— 4·4861	*s* & *p*	With corresponding obs. of Standard stars
Aug. 1	— 4·4855 — 4·4861	*s* only	— 4·4855 — 4·4861	*p* only	
2	— 4·4855 — 5·5021	*s* & *p*	— 4·4855 — 5·5021	*s* & *p*	
3	— 4·4846 — 5·5021	*s* only	— 4·4846 — 5·5021	*p* only	
4	— 4·4843 — 5·5021	*s* only	— 4·4843 — 5·5021	*p* only	
5	— 4·4843	*s* & *p*	— 4·4843	*s* & *p*	With corresponding obs. of Standard stars
6	— 5·5006	*s* & *p*	— 5·5006	*s* & *p*	Do.
7	— 5·5006	*s* & *p*	— 5·5006	*s* & *p*	Do.
8	— 5·5006	*s* & *p*	— 5·5006	*s* & *p*	Do.
9	— 5·5006	*s* & *p*	— 5·5006	*s* & *p*	Do.
10	— 5·5006 — 5·4992	*p* only	— 5·5006 — 4·4992	*s* only	Or *s* & *p* at most favourable hour angles for each.
11	— 5·5006 — 5·4992	*p* only	— 5·5006 — 4·4992	*s* only	Do.
12	— 5·4992	*p* only	— 5·4992	*s* only	With corresponding obs. of Standard stars
13	— 5·4992	*s* & *p*	— 5·4992	*s* & *p*	Do.
14	— 5·4992	*s* only	— 5·4992	*p* only	Do.
15	— 5·4992	*s* & *p*	— 5·4992	*s* & *p*	Do.
16	— 5·4992	*p* only	— 5·4992	*s* only	Do.
17	— 5·4985 — 5·4989	*s* only	— 5·5006 — 6·5151	*s* only	
18	— 5·4985 — 5·4989	*s* only	— 5·5006 — 6·5151	*s* only	
19	— 5·4985 — 5·4989	*s* only	— 5·5006 — 6·5151	*s* only	
20	— 5·4989	*s* only & Standard stars	— 5·4992 — 6·5158	*s* only	
21	— 5·4989	*s* only & Standard stars	— 5·4992 — 6·5158	*s* only	
22	— 5·4989	*s* & *p*	— 5·4989	*s* & *p*	With corresponding obs. of Standard stars
23	— 5·4989	*s* & *p*	— 5·4989	*s* & *p*	Do.
24	— 5·4989	*p* only	— 5·4989	*s* only	Do.
25	— 5·4989	*s* & *p*	— 5·4989	*s* & *p*	Do.
26	— 5·4989	*s* & *p*	— 5·4989	*s* & *p*	Do.

The methods of observation and the employment of the reversing prism should be the same as in the *Iris* Observations of 1888.

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Programme for Meridian Observations.

The proposals contained in the preceding programme involve accurate determinations of the places of the planet and comparison stars by meridian observations at a number of different observatories.

Such observations afford the most ready means of determining the necessary corrections to the tabular motion of the planet, and of obtaining, at once, approximately exact tabular quantities for comparison with the Heliometer observations.

It is very desirable, if possible, to obtain observations of the comparison stars sufficient in number and in accuracy to warrant a discussion of the whole series of Heliometer observations on the supposition that the errors of the star places are small enough to be neglected, or rather to be regarded as increasing, in a nearly insensible degree, the accidental errors of the places of the planet deduced from Heliometer measures when the star places are assumed known. It is unnecessary to dwell here on the advantages which such a method of reduction offers, and on the interesting points which might be so investigated. Certain it is that, the more nearly we can approach to that mode of reduction, the more reliable and complete will be the discussion.

To this end it is requisite that every comparison star should be observed at each of the co-operating meridian observatories. Some of the comparison stars enter far more frequently into the programme than others, and such stars should be relatively more accurately determined. But to make a number of meridian observations proportional to the number of nights on which it is proposed to observe each star, would involve a larger amount of work than could be accomplished at any single observatory. At each meridian observatory it is desirable that each of the thirty-seven stars should be observed at least twice, and a minimum of five observations for the most important stars is suggested, with intermediate numbers of three and four observations for others, and seven observations for the two standard stars. But a larger number of observations in a like proportion will be most acceptable.

The following corrected ephemeris of the planet has been computed at the office of the *Berliner Jahrbuch* :—

(12) VICTORIA.

Mean Places, 1889·0.

1889.	α h m s	δ ° ′	Log Δ	Log r	1889.	α h m s	δ ° ′	Log Δ	Log r
June 2	20 2 12	— 10 15·0	0·0105	0·2688	June 12	20 3 8	— 8 33·7		
3	2 28	— 10 4·6			13	3 2	24·1		
4	2 41	— 9 54·2			14	2 54	14·6	9·9730	0·2660
5	2 52	43·9			15	2 44	— 8 5·2		
6	3 1	33·6	9·9973	0·2678	16	2 32	— 7 56·0		
7	3 8	23·4			17	2 18	46·9		
8	3 13	13·3			18	2 2	38·0	9·9619	0·2652
9	3 15	— 9 3·3			19	1 44	29·2		
10	3 15	— 8 53·3	9·9848	0·2669	20	1 24	20·5		
11	3 13	43·4			21	1 2	12·0		
12	20 3 8	— 8 33·7			22	20 0 37	— 7 3·7	9·9517	0·2645

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(12) VICTORIA—*continued.*

Mean Places, 1889·0—*continued.*

1889.	α h m s	δ ° ′	Log Δ	Log r	1889.	α h m s	δ ° ′	Log Δ	Log r
June 22	20 0 37	— 7 3·7	9·9517	0·2645	July 26	19 35 41	— 4 38·6		
23	0 11	— 6 55·6			27	34 55	38·8		
24	19 59 43	47·6			28	34 11	39·3	9·9229	0·2610
25	59 13	39·8			29	33 28	40·0		
26	58 42	32·3	9·9426	0·2638	30	32 46	41·0		
27	58 9	25·0			31	32 5	42·2		
28	57 34	17·8			Aug. 1	31 26	43·6	9·9275	0·2610
29	56 58	10·8			2	30 48	45·2		
30	56 20	— 6 4·1	9·9349	0·2632	3	30 11	47·1		
July 1	55 41	— 5 57·6			4	29 36	49·1		
2	55 0	51·4			5	29 3	51·3	9·9337	0·2610
3	54 18	45·4			6	28 32	53·7		
4	53 36	39·6	9·9284	0·2627	7	28 2	56·2		
5	52 52	34·1			8	27 34	— 4 58·9		
6	52 7	28·8			9	27 9	— 5 1·8	9·9412	0·2612
7	51 21	23·8			10	26 45	4·8		
8	50 33	19·0	9·9234	0·2622	11	26 23	8·0		
9	49 45	14·5			12	26 3	11·3		
10	48 56	10·3			13	25 45	14·8	9·9499	0·2614
11	48 7	6·3			14	25 29	18·4		
12	47 18	— 5 2·6	9·9200	0·2618	15	25 15	22·1		
13	46 28	— 4 59·2			16	25 4	25·9		
14	45 38	56·0			17	24 55	29·7	9·9596	0·2616
15	44 47	53·1			18	24 48	33·6		
16	43 56	50·4	9·9182	0·2615	19	24 43	37·7		
17	43 5	48·0			20	24 40	41·9		
18	42 14	45·9			21	24 40	46·1	9·9702	0·2620
19	41 23	44·1			22	24 42	50·4		
20	40 33	42·5	9·9181	0·2613	23	24 46	54·7		
21	39 43	41·2			24	24 52	— 5 59·0		
22	38 54	40·2			25	25 0	— 6 3·4	9·9816	0·2624
23	38 5	39·4			26	25 10	7·8		
24	37 16	38·9	9·9197	0·2611	27	25 23	12·2		
25	36 28	38·6			28	25 38	16·7		
26	19 35 41	— 4 38·6			29	19 25 55	— 6 21·2	9·9937	0·2629

Opposition in R.A. 1889, July 16. Magnitude = 8·1.

The following is a list of the comparison stars, arranged in order of Right Ascension. The places are given for the Equinox 1855 as well as 1889, to facilitate identification of the stars on the charts of Schönfeld's Durchmusterung.

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Comparison Stars for Victoria.

No.	Adopted Name.	D.M.	Mag.	1855. α	1855. δ	1889. α	1889. δ	Suggested No. of obs.
		°		h m s	° ′	h m s	° ′	
1	a	— 6·5151	7·7	19 19 37	— 6 1·2	19 21 26	— 5 57·3	2
2	b	— 6·5158	8·3	21 13	— 6 27·8	23 2	— 6 23·9	2
3	c	— 5·4985	8·5	22 17	— 5 13·3	24 6	— 5 9·3	3
4	d	— 5·4989	8·4	23 29	— 5 58·3	25 18	— 5 54·3	5
5	e	— 5·4992	8·2	23 52	— 5 25·6	25 40	— 5 21·5	5
6	f	— 5·5006	7·6	26 2	— 5 2·8	27 51	— 4 58·6	5
7	g	— 4·4843	8·5	26 49	— 4 45·6	28 37	— 4 41·4	3
8	h	— 4·4846	7·8	27 33	— 4 37·1	29 21	— 4 32·9	2
9	i	— 5·5021	7·8	28 53	— 5 5·6	30 42	— 5 1·3	3
10	k	— 4·4855	7·5	29 6	— 4 36·5	30 55	— 4 32·2	3
11	l	— 3·4649	8·0	29 35	— 3 47·5	31 22	— 3 43·2	2
12	m	— 4·4861	5·0	30 6	— 4 57·8	31 54	— 4 53·5	4
13	n	— 5·5036	6·8	32 38	— 5 46·6	34 27	— 5 42·1	3
14	o	— 4·4877	7·5	33 5	— 4 21·7	34 53	— 4 17·2	2
15	p	— 4·4883	7·7	34 9	— 4 36·9	35 56	— 4 32·4	7
16	q	— 4·4903	8·3	37 35	— 4 52·0	39 23	— 4 47·3	4
17	r	— 4·4916	7·8	39 12	— 4 0·3	40 59	— 3 55·5	2
18	s	— 5·5060	7·8	40 5	— 5 35·1	41 53	— 5 30·3	2
19	t	— 4·4926	7·8	41 17	— 4 51·1	43 5	— 4 46·2	7
20	u	— 4·4936	8·0	41 56	— 4 53·4	43 44	— 4 48·5	2
21	v	— 5·5075	6·5	43 8	— 5 3·2	44 56	— 4 58·3	3
22	w	— 4·4960	8·0	45 40	— 4 56·7	47 28	— 4 51·7	4
23	x	— 5·5099	8·0	46 34	— 5 25·2	48 22	— 5 20·1	4
24	y	— 5·5120	8·2	49 38	— 5 4·2	51 25	— 4 59·0	4
25	z	— 5·5124	8·5	50 15	— 5 34·2	52 3	— 5 28·9	4
26	α	— 6·5320	8·2	50 29	— 6 44·3	52 18	— 6 39·0	2
27	β	— 4·4984	8·2	50 50	— 4 44·7	52 38	— 4 39·4	2
28	γ	— 4·4992	7·8	53 9	— 4 42·5	54 57	— 4 37·1	2
29	δ	— 6·5339	8·2	53 51	— 6 46·4	55 40	— 6 41·0	3
30	ε	— 5·5138	6·3	54 30	— 5 23·4	56 18	— 5 18·0	3
31	ζ	— 8·5205	8·1	55 15	— 8 5·3	57 5	— 7 59·8	3
32	η	— 5·5144	8·2	55 34	— 5 1·9	57 22	— 4 56·4	3
33	θ	— 6·5360	8·5	57 34	— 6 59·7	19 59 23	— 6 54·1	3
34	ι	— 4·5016	7·2	58 56	— 4 49·9	20 0 44	— 4 44·3	2
35*	...	— 7·5169	8·2	58 58	— 7 25·7	0 47	— 7 20·1	5
36	κ	— 8·5237	7·3	19 59 14	— 8 35·8	1 5	— 8 30·2	2
...	λ	— 7·5183	8·1	20 0 56	— 7 26·2	2 46	— 7 20·5	5
37	μ	— 9·5382	6·5	20 3 19	— 9 16·0	5 10	— 9 10·2	5

* No. 35. The star λ was afterwards substituted for No. 35.

Note.—It was originally proposed to employ D.M. —5°·5091 and —7°·5092 as standard stars, but the equally suitable stars —4°·4883 —4°·4926 (which are also frequently used as comparison stars) have since been substituted, in order to diminish the number of stars requiring meridian observation. It is requested that these stars be always observed together on the same night.

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The following stars should be observed on every night as culminators, in order to determine errors depending on magnitude :

D.M.	Mag.	α	δ	D.M.	Mag.	α	δ
°		h m s	° ′	°		h m s	° ′
— 8·4887	5·7	19 6 39	— 8 6·8	— 6·5451	6·3	20 14 31	— 6 42·4
— 5·4936	5·0	19 14 38	— 5 37·2	— 3·4888	6·3	20 18 55	— 3 9·0

These positions are for 1889·0.

Near some parts of the planet's path there are small stars which might be readily mistaken for the planet, and it may be well that the observer, before beginning work on each night, should make a sketch, from the maps of Schönfeld's Durchmusterung, of the stars near the position of the planet. The corrections to reduce the Ephemeris of *Victoria* to the equinox of the Durchmusterung are :—

June	2	— 1 m 52 s	— 5′·8	July	22	— 1 m 48 s	— 4′·8
,,	22	— 1 49	— 5·7	Aug.	11	— 1 48	— 4·2
July	12	— 1 48	— 5·2	,,	31	— 1 49	— 4·2

Programme for Photographic Observations.

Observatories Provided with Suitable Appliances can afford Valuable Co-Operation under the two Following Heads :—

I. Photographs taken at any considerable zenith distance (showing the planet as a short, well defined line* near the centre of the field, and the neighbouring stars as well defined discs) are available for determination of the parallax in combination with similar photographs in the opposite hemisphere, provided that means exist for determining the distortion of the photographic film, and the optical distortion of the field. Unfortunately it is improbable that any of the new Southern Photographic Instruments will be ready in time to take part in this work, and therefore the Northern Photographic observations should be so made as to be directly comparable with the Southern Heliometer measures—that is to say they should be confined to those nights when the selected comparison stars are less than *one degree* distant from the planet, and be made at suitable hour angles as indicated in the Heliometer programme. It is essential to attend to the following particulars :—

(*a*) To eliminate distortion of the film, impress on each plate the latent image of a known *réseau* before exposure.
(*b*) To determine optical distortion, make several photographs of a well known group of stars, *e.g.*, the Pleiades.
(*c*) Make no change in the focal adjustment throughout the whole series of observations.
(*d*) Note the temperature of the tube at each exposure.
(*e*) Note the reading of the external thermometer and barometer for computation of the refraction.
(*f*) Note the fixed star employed as the guiding star.
(*g*) Note the Sidereal Time of the beginning and end of each exposure, to the nearest second.

* The daily motion of the planet at opposition is about 30″ per hour, or 2″ of arc in 4 minutes. As the latter will probably be sufficient time for exposure with the 13 inch telescopes, there will be no difficulty in bisecting accurately so short a line.

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II. Any photographs, taken with the above precautions and showing all the star-discs well defined, will also be valuable for strengthening the meridian determinations of the places of the comparison stars.

If several series of such plates could be secured, their measurement and discussion would not only be a powerful aid to the present investigation, but would afford most interesting and necessary information in connection with the future work of the permanent Committee of the Astrophotographic Congress.

The dates upon which photographic observations of *Victoria* can be advantageously combined with Heliometer observations are :

1889.—June 10 *e*, 11 *e*, 19 *e*, 20 *e*, 21 *e*, 22 *e*, 23 *e*, 24 *e*, 25 *e*.
July 5 *e* & *w*, 6 *e* & *w*, 7 *e* & *w*, 8 *e* & *w*, 9 *e* & *w*, 10 *e* & *w*, 11 *e* & *w*, 12 *e* & *w*, 13 *e* & *w*, 14 *e* & *w*, 15 *e* & *w*, 16 *e* & *w*, 17 *e* & *w*, 18 *e* & *w*, 19 *e* & *w*, 20 *e* & *w*, 21 *e* & *w*, 22 *e* & *w*, 23 *e*, 24 *e*, 25 *e* & *w*, 26 *e* & *w*, 27 *e* & *w*, 28 *e* & *w*, 29 *w*, 30 *w*, 31 *e* & *w*.

And during the whole period from Aug. 1 to Aug. 26, inclusive, both *e* & *w*.

Meridian Observations of "Victoria."

The following ephemeris of *Victoria* for the opposition of 1889 has been computed at the office of the *Berliner Jahrbuch*, from elements of the planet which have been corrected from the observations of 1888.

It is desirable that Observatories co-operating in the Meridian Observations of *Victoria* should compare their observations with this ephemeris, employing 8″·80 for the Solar Parallax. The results obtained by different Astronomers at the same Observatory should be indicated by the initials of the Observer.

The discussion of the Meridian Observations has been kindly undertaken by Dr. AUWERS, to whom the detailed results should be sent as soon as possible. Meanwhile, to prevent the possible neglect of any existing series of observations, it is desirable that the Directors of co-operating Observatories should send me, as soon as possible, a list of the number of Meridian Observations of each star (including the culminators), and of the dates on which the planet has been observed.

DAVID GILL.

Royal Observatory, Cape of Good Hope,
1889 *September* 30.

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(12) VICTORIA.

Apparent Places for Berlin Midnight.

1889.		α	1st Diff.	2nd Diff.	δ	1st Diff.	2nd Diff.	Log Δ	Aberr. Time.
		h m s	s	s	° ′ ″	′ ″	″		m s
June	2	20 2 13·21	+ 14·98		− 10 14 54·9	+ 10 28·0		0·01 0421	8 30
	3	2 28·19	12·89	− 2·09	10 4 26·9	10 24·3	− 3·7	00 7106	8 26
	4	2 41·08	10·80	2·09	9 54 2·6	10 20·4	3·9	00 3820	8 22
	5	2 51·88	8·72	2·08	9 43 42·2	10 16·2	4·2	0·00 0564	8 18
	6	3 0·60	6·63	2·09	9 33 26·0	10 11·6	4·6	9·99 7341	8 15
	7	3 7·23	4·53	2·10	9 23 14·4	10 6·7	4·9	99 4152	8 11
	8	3 11·76	2·43	2·10	9 13 7·7	10 1·4	5·3	99 0999	8 8
	9	3 14·19	+ 0·35	2·08	9 3 6·3	9 55·8	5·6	98 7883	8 4
	10	3 14·54	− 1·73	2·08	8 53 10·5	9 49·9	5·9	98 4807	8 1
	11	3 12·81	3·82	2·09	8 43 20·6	9 43·5	6·4	98 1772	7 57
	12	3 8·99	5·89	2·07	8 33 37·1	9 36·8	6·7	97 8780	7 54
	13	3 3·10	7·97	2·08	8 24 0·3	9 29·8	7·0	97 5833	7 51
	14	2 55·13	10·04	2·07	8 14 30·5	9 22·4	7·4	97 2934	7 48
	15	2 45·09	12·10	2·06	8 5 8·1	9 14·5	7·9	97 0084	7 45
	16	2 32·99	14·15	2·05	7 55 53·6	9 6·3	8·2	96 7285	7 42
	17	2 18·84	16·19	2·04	7 46 47·3	8 57·7	8·6	96 4540	7 39
	18	2 2·65	18·20	2·01	7 37 49·6	8 48·6	9·1	96 1852	7 36
	19	1 44·45	20·19	1·99	7 29 1·0	8 39·2	9·4	95 9222	7 33
	20	1 24·26	22·16	1·97	7 20 21·8	8 29·3	9·9	95 6652	7 30
	21	1 2·10	24·08	1·92	7 11 52·5	8 18·9	10·4	95 4145	7 28
	22	0 38·02	25·97	1·89	7 3 33·6	8 8·2	10·7	95 1704	7 25
	23	20 0 12·05	27·83	1·86	6 55 25·4	7 57·1	11·1	94 9331	7 23
	24	19 59 44·22	29·64	1·81	6 47 28·3	7 45·6	11·5	94 7029	7 21
	25	59 14·58	31·39	1·75	6 39 42·7	7 33·7	11·9	94 4800	7 18
	26	58 43·19	33·09	1·70	6 32 9·0	7 21·5	12·2	94 2646	7 16
	27	58 10·10	34·72	1·63	6 24 47·5	7 8·9	12·6	94 0570	7 14
	28	57 35·38	36·30	1·58	6 17 38·6	6 55·8	13·1	93 8573	7 12
	29	56 59·08	37·82	1·52	6 10 42·8	6 42·5	13·3	93 6658	7 10
	30	56 21·26	39·26	1·44	6 4 0·3	6 28·8	13·7	93 4827	7 8
July	1	55 42·00	40·63	1·37	5 57 31·5	6 14·9	13·9	93 3082	7 7
	2	55 1·37	41·91	1·28	5 51 16·6	6 0·7	14·2	93 1425	7 5
	3	54 19·46	43·11	1·20	5 45 15·9	5 46·1	14·6	92 9858	7 4
	4	53 36·35	44·24	1·13	5 39 29·8	5 31·4	14·7	92 8382	7 2
	5	52 52·11	45·28	1·04	5 33 58·4	5 16·3	15·1	92 6999	7 1
	6	52 6·83	46·23	0·95	5 28 42·1	5 1·1	15·2	92 5711	7 0
	7	51 20·60	47·10	0·87	5 23 41·0	4 45·8	15·3	92 4518	6 58
	8	50 33·50	47·87	0·77	5 18 55·2	4 30·3	15·5	92 3422	6 57
	9	49 45·63	48·55	0·68	5 14 24·9	4 14·6	15·7	92 2424	6 56
	10	48 57·08	49·15	0·60	5 10 10·3	3 58·8	15·8	92 1525	6 55
	11	48 7·93	− 49·66	0·51	5 6 11·5	+ 3 42·9	15·9	92 0726	6 55
	12	19 47 18·27		− 0·42	− 5 2 28·6		− 16·0	9·92 0027	6 54

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(12) VICTORIA—*continued.*

Apparent Places for Berlin Midnight—continued.

1889.		α	1st Diff.	2nd Diff.	δ	1st Diff.	2nd Diff.	Log Δ	Aberr. Time.
		h m s	s	s	° ′ ″	′ ″	″		m s
July	12	19 47 18·27			− 5 2 28·6			9·92 0027	6 54
			− 50·08			+ 3 26·9			
	13	46 28·19		− 0·34	4 59 1·7		− 16·1	91 9429	6 53
			50·42			3 10·8			
	14	45 37·77		0·23	4 55 50·9		16·1	91 8934	6 53
			50·65			2 54·7			
	15	44 47·12		0·15	4 52 56·2		16·2	91 8541	6 53
			50·80			2 38·5			
	16	43 56·32		− 0·04	4 50 17·7		16·2	91 8252	6 52
			50·84			2 22·3			
	17	43 5·48		+ 0·06	4 47 55·4		16·3	91 8066	6 52
			50·78			2 6·0			
	18	42 14·70		0·15	4 45 49·4		16·2	91 7984	6 52
			50·63			1 49·8			
	19	41 24·07		0·27	4 43 59·6		16·0	91 8006	6 52
			50·36			1 33·8			
	20	40 33·71		0·36	4 42 25·8		16·1	91 8132	6 52
			50·00			1 17·7			
	21	39 43·71		0·46	4 41 8·1		15·8	91 8363	6 52
			49·54			1 1·9			
	22	38 54·17		0·57	4 40 6·2		15·8	91 8697	6 53
			48·97			0 46·1			
	23	38 5·20		0·67	4 39 20·1		15·6	91 9134	6 53
			48·30			0 30·5			
	24	37 16·90		0·77	4 38 49·6		15·3	91 9674	6 54
			47·53			0 15·2			
	25	36 29·37		0·88	4 38 34·4		15·0	92 0316	6 54
			46·65			+ 0 0·2			
	26	35 42·72		0·96	4 38 34·2		14·9	92 1059	6 55
			45·69			− 0 14·7			
	27	34 57·03		1·07	4 38 48·9		14·6	92 1902	6 56
			44·62			0 29·3			
	28	34 12·41		1·16	4 39 18·2		14·1	92 2843	6 57
			43·46			0 43·4			
	29	33 28·95		1·25	4 40 1·6		13·8	92 3882	6 58
			42·21			0 57·2			
	30	32 46·74		1·33	4 40 58·8		13·5	92 5017	6 59
			40·88			1 10·7			
	31	32 5·86		1·41	4 42 9·5		13·1	92 6246	7 0
			39·47			1 23·8			
Aug.	1	31 26·39		1·50	4 43 33·3		12·7	92 7568	7 1
			37·97			1 36·5			
	2	30 48·42		1·56	4 45 9·8		12·3	92 8980	7 3
			36·41			1 48·8			
	3	30 12·01		1·64	4 46 58·6		11·8	93 0480	7 4
			34·77			2 0·6			
	4	29 37·24		1·69	4 48 59·2		11·3	93 2067	7 6
			33·08			2 11·9			
	5	29 4·16		1·75	4 51 11·1		10·9	93 3739	7 7
			31·33			2 22·8			
	6	28 32·83		1·81	4 53 33·9		10·5	93 5493	7 9
			29·52			2 33·3			
	7	28 3·31		1·85	4 56 7·2		9·9	93 7327	7 11
			27·67			2 43·2			
	8	27 35·64		1·90	4 58 50·4		9·6	93 9239	7 13
			25·77			2 52·8			
	9	27 9·87		1·94	5 1 43·2		9·0	94 1226	7 15
			23·83			3 1·8			
	10	26 46·04		1·97	5 4 45·0		8·7	94 3287	7 17
			21·86			3 10·5			
	11	26 24·18		2·00	5 7 55·5		8·1	94 5419	7 19
			19·86			3 18·6			
	12	26 4·32		2·04	5 11 14·1		7·8	94 7621	7 21
			17·82			3 26·4			
	13	25 46·50		2·07	5 14 40·5		7·3	94 9890	7 24
			15·75			3 33·7			
	14	25 30·75		2·10	5 18 14·2		6·8	95 2224	7 26
			13·65			3 40·5			
	15	25 17·10		2·12	5 21 54·7		6·4	95 4622	7 28
			11·53			3 46·9			
	16	25 5·57		2·14	5 25 41·6		6·0	95 7080	7 31
			9·39			3 52·9			
	17	24 56·18		2·18	5 29 34·5		5·5	95 9598	7 34
			7·21			3 58·4			
	18	24 48·97		2·18	5 33 32·9		5·1	96 2173	7 36
			5·03			4 3·5			
	19	24 43·94		2·20	5 37 36·4		4·6	96 4802	7 39
			2·83			4 8·1			
	20	24 41·11		2·22	5 41 44·5		4·2	96 7484	7 42
			− 0·61	+ 2·22		− 4 12·3			
	21	19 24 40·50			− 5 45 56·8		− 3·6	9·97 0217	7 45

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(12) VICTORIA—*continued.*

Apparent Places for Berlin Midnight—continued.

1889.		α	1st Diff.	2nd Diff.	δ	1st Diff.	2nd Diff.	Log Δ	Aberr. Time.
		h m s	s	s	° ′ ″	′ ″	″		m s
Aug.	21	19 24 40·50	+ 1·61		− 5 45 56·8	− 4 15·9		9·97 0217	7 45
	22	24 42·11	3·85	+ 2·24	5 50 12·7	4 19·2	− 3·3	97 2998	7 48
	23	24 45·96	6·10	2·25	5 54 31·9	4 22·0	2·8	97 5826	7 51
	24	24 52·06	8·34	2·24	5 58 53·9	4 24·3	2·3	97 8698	7 54
	25	25 0·40	10·59	2·25	6 3 18·2	4 26·3	2·0	98 1613	7 57
	26	25 10·99	12·83	2·24	6 7 44·5	4 27·8	1·5	98 4568	8 0
	27	25 23·82	15·07	2·24	6 12 12·3	4 28·9	1·1	98 7561	8 4
	28	25 38·89	17·30	2·23	6 16 41·2	4 29·6	0·7	99 0590	8 7
	29	25 56·19	19·52	2·22	6 21 10·8	4 29·8	− 0·2	99 3653	8 11
	30	26 15·71	21·73	2·21	6 25 40·6	4 29·6	+ 0·2	99 6748	8 14
	31	26 37·44	23·92	2·19	6 30 10·2	4 29·1	0·5	9·99 9873	8 18
Sept.	1	27 1·36	26·09	2·17	6 34 39·3	4 28·3	0·8	0·00 3026	8 21
	2	27 27·45	28·24	2·15	6 39 7·6	4 26·9	1·4	00 6205	8 25
	3	27 55·69	30·36	2·12	6 43 34·5	4 25·3	1·6	00 9409	8 29
	4	28 26·05	32·47	2·11	6 47 59·8	4 23·4	1·9	01 2636	8 32
	5	28 58·52	34·53	2·06	6 52 23·2	4 21·2	2·2	01 5885	8 36
	6	29 33·05	36·57	2·04	6 56 44·4	4 18·6	2·6	01 9153	8 40
	7	30 9·62	38·58	2·01	7 1 3·0	4 15·7	2·9	02 2439	8 44
	8	30 48·20	40·57	1·99	7 5 18·7	4 12·7	3·0	02 5742	8 48
	9	31 28·77	42·52	1·95	7 9 31·4	4 9·3	3·4	02 9062	8 52
	10	32 11·29	44·46	1·94	7 13 40·7	4 5·7	3·6	03 2396	8 56
	11	32 55·75	46·36	1·90	7 17 46·4	4 1·9	3·8	03 5743	9 0
	12	33 42·11	48·24	1·88	7 21 48·3	3 57·8	4·1	03 9103	9 5
	13	34 30·35	50·10	1·86	7 25 46·1	3 53·4	4·4	04 2474	9 9
	14	35 20·45	51·92	1·82	7 29 39·5	3 48·9	4·5	04 5855	9 13
	15	36 12·37	53·72	1·80	7 33 28·4	3 44·2	4·7	04 9246	9 18
	16	37 6·09	55·50	1·78	7 37 12·6	3 39·2	5·0	05 2645	9 22
	17	38 1·59	57·26	1·76	7 40 51·8	3 33·9	5·3	05 6051	9 26
	18	38 58·85	58·98	1·72	7 44 25·7	3 28·6	5·3	05 9464	9 31
	19	39 57·83	60·67	1·69	7 47 54·3	3 22·9	5·7	06 2882	9 35
	20	40 58·50	62·35	1·68	7 51 17·2	3 17·1	5·8	06 6304	9 40
	21	42 0·85	64·00	1·65	7 54 34·3	3 11·2	5·9	06 9730	9 44
	22	43 4·85	65·62	1·62	7 57 45·5	3 5·0	6·2	07 3159	9 49
	23	44 10·47	67·21	1·59	8 0 50·5	2 58·6	6·4	07 6590	9 54
	24	45 17·68	68·78	1·57	8 3 49·1	2 52·1	6·5	08 0022	9 58
	25	46 26·46	70·32	1·54	8 6 41·2	2 45·3	6·8	08 3454	10 3
	26	47 36·78	71·82	1·50	8 9 26·5	2 38·5	6·8	08 6885	10 8
	27	48 48·60	73·30	1·48	8 12 5·0	2 31·4	7·1	09 0314	10 13
	28	50 1·90	74·75	1·45	8 14 36·4	2 24·3	7·1	09 3741	10 18
	29	51 16·65	+ 76·17	+ 1·42	8 17 0·7	− 2 17·0	+ 7·3	09 7165	10 23
	30	19 52 32·82			− 8 19 17·7			0·10 0586	10 28

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Programme for Observation of the Minor Planet Sappho.

The following programme has been prepared for observation of the minor planet *Sappho* at its opposition in 1889 :

The primary object is, as in the case of *Victoria*, to determine the solar parallax from Heliometer Observations in both Hemispheres, and the comparison stars have been selected on the same general plan as those for *Victoria*.

There is, however, increasing evidence to shew the great value of Photographic Observations for such purposes and no effort should be spared, by those who possess the necessary means, to make as large a number of Photographic Observations as possible.

The geometrical conditions are represented in the following tables :

Hour Angle.	Cape. $\phi = -33° 56'$		European Observatories. $\phi = +51°$		New Haven. $\phi = +41° 19'$	
	q	ζ	q	ζ	q	ζ
h m	°	°	°	°	°	°
2 0	149·5	54·9	26·8	44·4	37·3	38·6
2 30	143·9	58·6	31·1	48·0	41·8	43·3
3 0	139·0	63·5	34·4	52·0	45·4	48·2
3 30	135·0	68·5	36·8	56·2	47·5	53·5
4 0	131·6	73·8	38·8	60·7	49·5	59·1
4 30	.....	.....	39·7	65·3	50·4	64·6
5 0	.....	.....	40·1	70·0	50·2	70·3

The proposed observations extend from September 18 to October 28 inclusive.

In the case of *Sappho* the hour angles of observation are much less limited by twilight than in the case of *Victoria*.

If we assume that observations can be made when the sun is 8° below the horizon, then we have the following limits due to twilight :

	Cape. Hour Angle.	European Observatories. Hour Angle.	New Haven. Hour Angle.
	h m	h m	h m
Sept. 18	+ 4 7	+ 3 42	+ 3 52
Oct. 29	− 2 54	− 4 28	− 4 17

Thus in the beginning of the series the morning observations in the N. Hemisphere can be continued to a zenith distance of 57° or 58°, and at the end of the series the Cape evening observations can be begun at 60° or 61° of zenith distance. At intermediate dates the conditions are, of course, still more favourable.

If, as in the case of *Victoria*, we assume that for the investigation of planetary parallax a mean zenith distance of about 60° is on the whole the best, the most advantageous mean hour angles of observation will be + and − 3^h at the Cape and + and − 4^h at the Northern observatories; and the position angles giving the largest parallax factor are

For observations W. of Meridian, N. Hemisphere
E. „ S. „ } $p = 40°$ and $220°$

For observations E. of Meridian, N. Hemisphere
W. „ S. „ } $p = 320°$ and $140°$

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Experience has shewn that not only are Heliometer measures of distance more accurate than those of position angle, but they are also made much more rapidly. Also, in order to avoid the necessity for measuring standard stars, it is better to observe the distance or position angle from two opposite and rather distant stars than from one star, even though the distance is small. Therefore in the selection of the comparison stars for *Sappho* the parallax is made to depend, as far as possible, on measures of distance only from two stars symmetrically situated with respect to the planet. Only in a very few instances, where no suitable pairs are available, one star has been selected, and generally, in such cases, the star is so close to the planet that the observation of the standard stars is unnecessary. Only on October 3 (E. and W.), and on October 22 (W. obs. of N. Hemisphere) will it be *necessary* to observe the standard stars, although it is desirable that they should be observed on other occasions when there is time to do so.

The standard stars are

D.M. + 11°·106 and + 12°·119.

There is only one point in connection with this programme which may render its realization somewhat difficult, viz.; the faintness of the planet itself. The existing data for prediction of its magnitude at opposition are somewhat meagre and conflicting. It is tolerably certain that the magnitude at opposition will be between 8·4 and 9·1, but one cannot say more. In the former case it could be observed with existing Heliometers with high accuracy, but in the latter case with much less precision. Should the planet be found to be difficult of accurate bisection on account of its faintness, then I would recommend that the use of the reversing prism should be dispensed with.

This may give rise to small systematic errors for the same stars on the same night, but if care is taken to equalize the apparent brightness of the star and planet by proper screens, such errors must be confined within very narrow limits indeed, and will certainly occur with different signs in different pairs and be practically eliminated in the mean.

The programmes for the Heliometric, Photographic and Meridian observations are attached.

DAVID GILL.

Royal Observatory, Cape of Good Hope,
1889 *July* 10.

Programme for Heliometer Observations.

1889.	*t* E. in N. Hemisphere. W. in S. °		*t* W. in N. Hemisphere. E. in S. °	
Sept. 18	+ 17·166 15·185	*s* only	+ 17·183 16·123	*s* only
19	+ 17·166 15·185	"	+ 17·183 16·123	"
20	+ 17·166 15·185	"	+ 16·129 16·123	"
21	+ 16·119 15·185	"	+ 16·129 16·123	"
22	+ 16·119 15·185	"	+ 16·129 16·123	"

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1889.	*t* E. in N. Hemisphere. W. in S. °	"	*t* W. in N. Hemisphere. E. in S. °	"	
Sept. 23	+ 16·119 15·177	*s* only	+ 16·129 15·164	*s* only	
24	+ 16·119 15·177	"	+ 16·129 15·164	"	
25	+ 16·116 15·177	"	+ 16·129 15·164	"	
26	+ 16·119 13·175	"	+ 15·175 15·164	"	
27	+ 16·119 13·175	"	+ 15·164 16·123	"	
28	+ 15·159 14·175	"	+ 16·123 14·168	"	
29	+ 15·159 14·175	"	+ 16·123 14·163	"	
30	+ 15·154 13·175	"	+ 16·123 14·163	"	
Oct. 1	+ 15·154 13·175	"	+ 15·164 14·168	"	
2	+ 15·154 13·175	"	+ 15·164 14·163	"	
3	+ 14·168 14·163	*p* only	+ 14·168 14·163	*s* only,	with Standard Stars E. & W.
4	+ 14·163	*s* & *p*	+ 14·163	*s* & *p*	Planet so near star that measures of Standard Stars not required.
5	+ 14·163 13·150	*p* only	+ 14·163 13·150	*s* only	
6	+ 14·163 13·150	*p* only	+ 14·163 13·150	*s* only	
7	+ 13·150	*s* & *p*	+ 13·150	*s* & *p*	Planet so near star that Standard Stars not required.
8	+ 13·150	*p* only	+ 13·150	*s* only,	with Standard Stars.
9	+ 13·143 12·126	*s* only	+ 14·163 11·118	"	
10	+ 13·130 12·126	"	+ 14·163 11·118	"	
11	+ 13·127 12·126	"	+ 13·155 12·108	"	
12	+ 13·130 11·135	"	+ 13·155 12·108	"	
13	+ 13·127 11·135	"	+ 13·127 11·135	*p* only	There is no suitable pair for *s*, for *t* W. in N. Hemisphere.
14	+ 12·104 11·135	"	+ 13·150 10·105	*s* only	
15	+ 12·104 11·135	"	+ 12·126 11·102	"	
16	+ 12·104 10·115	"	+ 12·126 11·102	"	
17	+ 11·106 10·115	"	+ 11·120 10·105	"	

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1889.	t E. in N. Hemisphere. W. in S. °		t W. in N. Hemisphere. E. in S. °	
Oct. 18	+ 11·106 10·115	s only	+ 11·120 10·105	s only
19	+ 11·106 9·110	"	+ 11·120 9·099	"
20	+ 11·106 9·110	"	+ 11·120 9·097	"
21	+ 11·102 9·110	"	+ 11·120 9·097	"
22	+ 11·102 9·110	"	+ 10·105	s only,
23	+ 11·102 9·110	"	+ 10·105 9·097	s only
24	+ 9·099	s & p without standard stars	+ 10·105 9·097	"
25	+ 9·099 9·097	p only	+ 9·099 9·097	"
26	+ 9·097 9·101	s only	+ 10·105 8·110	"
27	+ 9·090 9·101	"	+ 9·099 8·110	"
28	+ 9·099 8·110	p only	+ 9·099 8·110	"

and Standard Stars for Observation t W in N. Hemisphere.

In order to facilitate the computation of refraction it is requested that the declination and position circle be read off (to the nearest estimated minute and with one microscope) at the beginning and at the end of the observations of each star.

Programme for Meridian Observations.

The proposals contained in the preceding programme, involve, as in the case of *Victoria*, accurate determinations of the places of the planet and comparison stars by meridian observations at a number of different observatories. If these are sufficiently accurate and numerous in both Hemispheres they may be employed to determine the parallax in Declination, but the principal object is to determine the R.A. and Declination of the comparison stars with the highest possible accuracy, and to afford a ready means of determining the necessary corrections to the tabular motion of the planet.

It is very important that every comparison star should be observed *at least twice* at each Observatory; and, as in the case of *Victoria*, I have indicated a minimum number of times which it is desirable that each star should be observed in order that the accuracy of the resulting positions should, in some degree, correspond to the frequency with which the star enters into the programme.

Although the Heliometer observations only begin on September 18th, it is very desirable that the meridian observations should be commenced 10 days before that date, in order to afford a more

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complete control on the motion of the planet, and they should, for the same reason, be continued till November 1st. The following Ephemeris of the planet is taken from Mr. Robert Bryant's *Orbit of the Planet "Sappho."*

The list of comparison stars for *Sappho* differs somewhat from the original list which I communicated to Mr. Bryant, and which is published in the above-mentioned work. The changes have been made, after much consideration, for reasons already stated, and after some week's experience of the observations of *Victoria*.

When the places of *Sappho* are compared with Mr. Bryant's Ephemeris, it is requested, for sake of uniformity, that the value 8″·80 be adopted for the mean solar parallax.

(80) SAPPHO.

Apparent Geocentric Places at Greenwich Midnight.

1889.	α	δ	Log Δ	1889.	α	δ	Log Δ
	h m s	° ′ ″			h m s	° ′ ″	
Sept. 8	1 11 50·85	+ 18 2 5·8	9·972406	Oct. 6	0 57 36·90	+ 13 54 55·1	9·935393
9	11 41·05	17 57 49·7	9·970000	7	56 54·43	13 42 18·5	9·935532
10	11 29·22	17 53 11·1	9·967651	8	56 12·04	13 29 34·2	9·935785
11	11 15·41	17 48 10·2	9·965363	9	55 29·86	13 16 43·1	9·936154
12	10 59·68	17 42 47·1	9·963137	10	54 47·96	13 3 46·2	9·936638
13	10 42·06	17 37 2·1	9·960977	11	54 6·44	12 50 44·5	9·937235
14	10 22·62	17 30 55·3	9·958885	12	53 25·36	12 37 39·1	9·937944
15	10 1·40	17 24 26·8	9·956865	13	52 44·84	12 24 30·9	9·938767
16	9 38·45	17 17 36·9	9·954928	14	52 4·95	12 11 21·2	9·939702
17	9 13·79	17 10 35·7	9·953048	15	51 25·80	11 58 10·8	9·940752
18	8 47·44	17 2 53·3	9·951257	16	50 47·47	11 45 0·9	9·941912
19	8 19·46	16 54 59·9	9·949549	17	50 10·03	11 31 52·4	9·943183
20	7 50·01	16 46 45·8	9·947925	18	49 33·57	11 18 46·6	9·944560
21	7 19·15	16 38 10·8	9·946389	19	48 58·17	11 5 44·4	9·946035
22	6 46·86	16 29 15·8	9·944943	20	48 23·92	10 52 46·8	9·947635
23	6 13·23	16 20 1·3	9·943588	21	47 50·94	10 39 55·1	9·949332
24	5 38·40	16 10 27·9	9·942331	22	47 19·35	10 27 10·0	9·951132
25	5 2·39	16 0 35·9	9·941170	23	46 48·94	10 14 32·4	9·953032
26	4 25·33	15 50 25·9	9·940109	24	46 20·06	10 2 3·3	9·955029
27	3 47·29	15 39 58·0	9·939153	25	45 52·67	9 49 43·5	9·957121
28	3 8·38	15 29 13·4	9·938302	26	45 26·85	9 37 34·1	9·959305
29	2 28·67	15 18 12·9	9·937556	27	45 13·99	9 25 36·2	9·961579
30	1 48·23	15 6 57·2	9·936916	28	44 40·18	9 13 50·5	9·963942
Oct. 1	1 7·20	14 55 27·2	9·936383	29	44 19·41	9 2 17·0	9·966390
2	1 0 25·69	14 43 43·9	9·935961	30	44 0·42	8 50 57·0	9·968922
3	0 59 43·84	14 31 48·1	9·935652	31	43 43·27	8 39 51·1	9·971535
4	59 1·70	14 19 40·8	9·935454	Nov. 1	0 43 28·00	+ 8 28 59·8	9·974227
5	0 58 19·37	+ 14 7 22·8	9·935368				

The above is reprinted from Mr. Bryant's work, but the differences shew that there are several errors which the Author will doubtless correct in the *Astronomische Nachrichten.*

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Comparison Stars for Sappho.

No.	Adopted Name.	D.M.	Mag.	1855 α	1855 δ	1889 α	1889 δ	Suggested No. of Obs.
		°		h m s	° ′	h m s	° ′	
1	a	+ 8·110	7·7	0 40 39·3	+ 8 25·7	0 42 24·9	+ 8 36·9	4
2	b	9·090	9·0	40 45·0	9 29·1	42 30·8	9 40·3	2
3	c	11·102	8·6	42 38·7	11 2·4	44 24·7	11 13·6	4
4	d	9·097	8·5	43 1·7	9 36·4	44 47·6	9 47·6	5
5	e	11·106	7·0	44 0·1	11 59·9	45 46·4	12 11·1	7
6	e′	9·099	8·3	44 34·2	9 49·4	46 20·0	10 0·6	5
7	f	12·104	7·3	44 54·4	12 51·6	46 40·8	13 2·7	2
8	g	9·101	8·3	45 14·3	9 1·7	47 0·2	9 12·8	2
9	h	10·105	8·4	46 16·0	10 21·0	48 2·1	10 32·1	5
10	i	12·108	8·2	47 26·5	12 3·9	49 12·9	12 15·0	2
11	k	13·127	6·5	48 32·7	13 10·6	50 19·3	13 21·7	3
12	l	11·118	8·8	48 53·6	11 55·9	50 40·1	12 7·0	2
13	m	13·130	8·7	49 6·0	13 59·0	50 52·8	14 10·1	2
14	n	9·110	8·7	49 12·1	9 12·8	50 58·1	9 23·9	4
15	o	11·120	8·2	49 45·7	11 39·1	51 32·2	11 50·2	4
16	p	12·119	6·0	50 18·7	12 56·1	52 5·4	13 7·2	7
17	q	13·143	8·5	52 7·7	13 50·1	53 54·7	14 1·2	2
18	r	10·115	8·2	53 39·7	10 23·4	55 26·1	10 34·5	2
19	s	11·135	8·0	53 45·9	11 8·1	55 32·4	11 19·1	4
20	t	13·150	8·5	54 56·9	13 28·0	56 43·9	13 39·0	5
21	u	15·154	8·5	55 22·4	15 22·5	57 9·8	15 33·5	3
22	v	12·126	7·8	55 30·0	12 16·1	57 16·9	12 27·1	4
23	w	13·155	8·7	56 14·0	13 9·5	58 1·0	13 20·5	2
24	x	14·163	5·5	57 26·8	14 9·8	59 14·0	14 20·8	7
25	y*	14·168	9·0	58 7·8	14 12·4	0 59 55·1	14 23·4	5
...	y	14·169	7·7	58 17·7	14 35·7	1 0 4·3	14 47·4	
26	z	15·159	8·5	0 58 41·9	15 32·3	0 29·6	15 43·3	2
27	α	15·164	8·0	1 0 11·8	15 4·7	1 59·4	15 15·7	5
28	β	16·116	8·0	0 12·4	16 37·5	2 0·4	16 48·5	2
29	γ	16·119	8·6	0 46·2	16 52·4	2 34·2	17 3·4	4
30	δ	14·175	6·4	2 31·4	14 53·6	4 19·1	15 4·5	2
31	ε	17·166	8·8	3 15·6	17 37·0	5 3·9	17 47·9	2
32	ζ	16·123	8·5	3 21·7	16 1·0	5 9·7	16 11·9	5
33	η	13·175	8·2	3 36·9	13 55·3	5 24·4	14 6·2	4
34	θ	15·175	8·5	5 8·4	15 59·5	6 56·6	16 10·4	2
35	ι	15·177	6·5	6 25·9	15 22·5	8 13·9	15 33·4	3
36	κ	16·129	8·3	8 25·8	16 51·5	10 14·2	17 2·4	4
37	λ	15·185	8·8	9 46·3	15 35·5	11 34·5	15 46·3	3
38	μ	+ 17·183	8·0	1 10 38·0	+ 17 49·4	1 12 26·9	+ 18 0·2	3

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The following stars should be observed on every night with the comparison stars:

Adopted Name.	D.M.	Mag.	1855		1889	
			α	δ	α	δ
	°		h m s	° ′	h m s	° ′
A	+ 10·065	7·3	0 29 46·1	+ 10 37·6	0 31 31·7	+ 10 48·9
B	15·106	7·3	0 35 18·3	15 52·3	0 37 4·7	16 3·5
C	10·171	7·0	1 15 15·3	10 36·5	1 17 2·5	10 47·3
D	+ 16·154	7·2	1 20 37·1	+ 16 20·1	1 22 26·1	+ 16 30·8

Programme for Photographic Observations.

It is very desirable that co-operating observatories should be provided with *réseaux* and be in a position to determine rigidly the distortion of the film and optical distortion of the field. But if their instruments are not yet provided with *réseaux*, the observations may still be of great value because distortion of the film corresponds with a purely accidental error, and can be practically eliminated by taking a sufficient number of plates.

Nor are any precautions necessary for orientation of the plates; that is afterwards determined from the comparison stars alone, and these serve also to determine the scale value.

It is desirable that the planet should be nearly in the centre of the plate, and that a star, *not* the planet, should be used as the guiding star. It is essential that the closest attention be paid to the centering of the object-glass or mirror employed, and that the plane of the photographic film be rigidly at right angles to the optical axis.

The Nasmyth lens (9 inches aperture, by Grubb) will be employed at the Cape, so that photographic observations made in the Northern Hemisphere may be combined with photographic as well as Heliometer observations made in the Southern Hemisphere.

Unfortunately no co-operation was secured in the photographic part of the programme, and therefore no measures or reductions of the photographs obtained at the Cape have as yet been made. Great improvements have since been made in our photographic apparatus, and it will probably be better to make a new series of plates at a future opportunity than to expend the labour of measurement and reduction on what must now be regarded as work of not the highest attainable perfection, especially as a sufficient number of Heliometer measures was secured at the Cape to balance those obtained in the Northern Hemisphere.

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It was originally intended that, at the Cape, Mr. W. H. Finlay, Chief Assistant, should share the observations with me, as he did in the *Iris* series, because a breakdown in the Cape series (the only Heliometer series in the Southern Hemisphere) would involve the failure of the whole scheme, and I feared that a long series of observations every morning and every evening, from June 10 to October 28, would involve a greater nervous and physical strain than a single observer could safely undertake. But, after these plans were settled, it became my duty to make arrangements for determining the Longitudes of stations on the West Coast of Africa by exchange of submarine telegraph signals, with Commander Pullen as the travelling observer, during the period when the *Victoria* and *Sappho* observations were to be undertaken and the services of Mr. Finlay were necessary for this work.

I had however been long in close correspondence with Professor A. Auwers, of Berlin. As he had previously devoted a great part of his scientific work to the determination of the Solar Parallax and considered the importance of the present undertaking so great, he expressed his readiness either to come personally and share the work, or to send to my assistance an observer who had been well trained in Heliometer observations in connection with the German Transit of Venus expeditions. Finally he found it possible to come to the Cape in person, and I enjoyed the great pleasure of his company whilst he shared with me the whole of the observations of *Victoria* from May 24 till September 5. Official duties in Berlin prevented his remaining to take part in the observations of *Sappho*, and he sailed for Europe on the latter date.

The Cape observations of *Victoria* are printed in detail in Vol. II., pp. 2–106.

The observations of *Sappho* at the Cape were made by myself (except those by Mr. Finlay on October 23), and are printed in Vol. II., pp. 210–232.

The observations of *Victoria* and *Sappho* at Yale College, New Haven, were made by Dr. Elkin and Mr. Hall, and communicated by Dr. Elkin in the form in which they are printed in Vol. II., *Victoria*, pp. 108–142 ; *Sappho*, pp. 234–252.

At Leipzig the observations were made by Dr. Peter, Assistant Astronomer to Dr. Bruns ; they are printed in Vol. II., *Victoria*, pp. 144–177 ; *Sappho*, pp. 234–270.

At Göttingen the observations of *Victoria* were made by Dr. Schur, Director of the Observatory, and those of *Sappho* by Dr. Schur and Dr. Ambronn, Assistant Astronomer. The instrumental readings, as originally communicated, are printed in Vol. II., *Victoria*, pp. 180–197 ; *Sappho*, pp. 272–280.

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At Bamberg the observations were made by Dr. Hartwig, Director of the Observatory (*see* Vol. II., *Victoria*, pp. 200–207 ; *Sappho*, pp. 282–284).

Meridian observations of the planet and comparison stars, in accordance with the programme, were made at the following observatories :—

Algiers.	Dublin.	Melbourne.
Berlin.	Greenwich.	Naples.
Bordeaux.	Hamburg.	Oxford (Radcliffe Obs.).
Cape of Good Hope.	Mount Hamilton.	Paris.
Cambridge (Eng.)	Köningsberg.	Pulkowa.
Cambridge (Mass.)	Leiden.	Vienna (Kuffner's Obs.).
Cincinnati.	Leipzig.	Washington.
Cordoba.		

When the Heliometer observations were collected it appeared that *Victoria* had been observed at one or more of the Heliometer observatories on every night, with only five exceptions, from June 10 to August 26, both inclusive. Thus, if the places of the comparison stars could be determined with probable errors small in proportion to those of the Heliometer observations, it would be possible to trace the path of the planet in the heavens, during nearly three complete revolutions of the Moon about the earth, with an accuracy equalling that of the determination of a star's parallactic ellipse, and hence to correct the tabular value of the lunar equation, and to utilize every observation towards determination of the parallax.

But the results of the Meridian observations showed that whilst the agreement of the Declinations of the stars determined at the different observatories was on the whole sufficiently good, the Right Ascensions exhibited discrepancies which rendered it necessary to increase their accuracy by some independent process.

Dr. Elkin at Yale, and Dr. Schur at Göttingen, having agreed to co-operate in the work, a final programme for a Heliometer-triangulation of the *Victoria* comparison stars was forwarded to them on 1890 January 7. The work was begun in April 1890 (*i.e.* as soon as the stars could be observed in the early morning), and was continued till November, when the stars were too near the Sun for further observation.

At Yale the observations were made by Mr. Chase, Assistant at the Observatory (Dr. Elkin being occupied with the completion of some researches on Stellar Parallax).

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At Göttingen the observations were made by Drs. Schur and Ambronn.

The Cape observations were made by Dr. Gill, Mr. Finlay, and Mr. Jacoby.*

The Meridian observations were collected and discussed by Professor Auwers; a full account of that work will be found in Vol. II., pp. 405–716.

The ephemerides of *Victoria* and *Sappho* were computed at the office of the *Berliner Jahrbuch* under the direction of the late Professor Tietjen.

The whole of the Heliometer reductions, and the other computations (excepting the refractions for the Yale observations which were computed by Mr. Chase), have been performed at the Cape. Every part of the work has been computed in duplicate, or tested by some independent method; in this work I have to acknowledge much valuable aid from Mr. W. H. Finlay, Chief Assistant, and the members of the Observatory staff generally.

A gift of 500 dollars offered through Professor E. C. Pickering on behalf of Miss C. W. Bruce, of New York (so well known for her many benefactions to astronomy), is gratefully acknowledged. This gift covered a great part of the cost of the arithmetical computations connected with the reduction of the Heliometer-triangulation of the *Victoria* comparison stars, before provision was made by the Admiralty for aid in the reduction of the remainder of the work.

Dr. Downing, Superintendent of the Nautical Almanac, has kindly read many of the final revises, thus often saving a second or third return of the sheets to the Cape.

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*Mr. Harold Jacoby was a member of the American Eclipse expedition to Cape Ledo in 1890, and, on the visit of the U.S. Ship "Pensacola" to Cape Town, with the Eclipse party on board, he expressed a wish to remain some months at the Cape. After acquiring some practice with the Heliometer he took part in the triangulation of the *Victoria* stars. He has since become favourably known to astronomers by his measurements and reductions of Rutherford's stellar photographs and other works carried out at Columbia College, New York.

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TRIANGULATION

OF THE

VICTORIA COMPARISON STARS.

A 13424—400—4/93 Wt 183 D & S.

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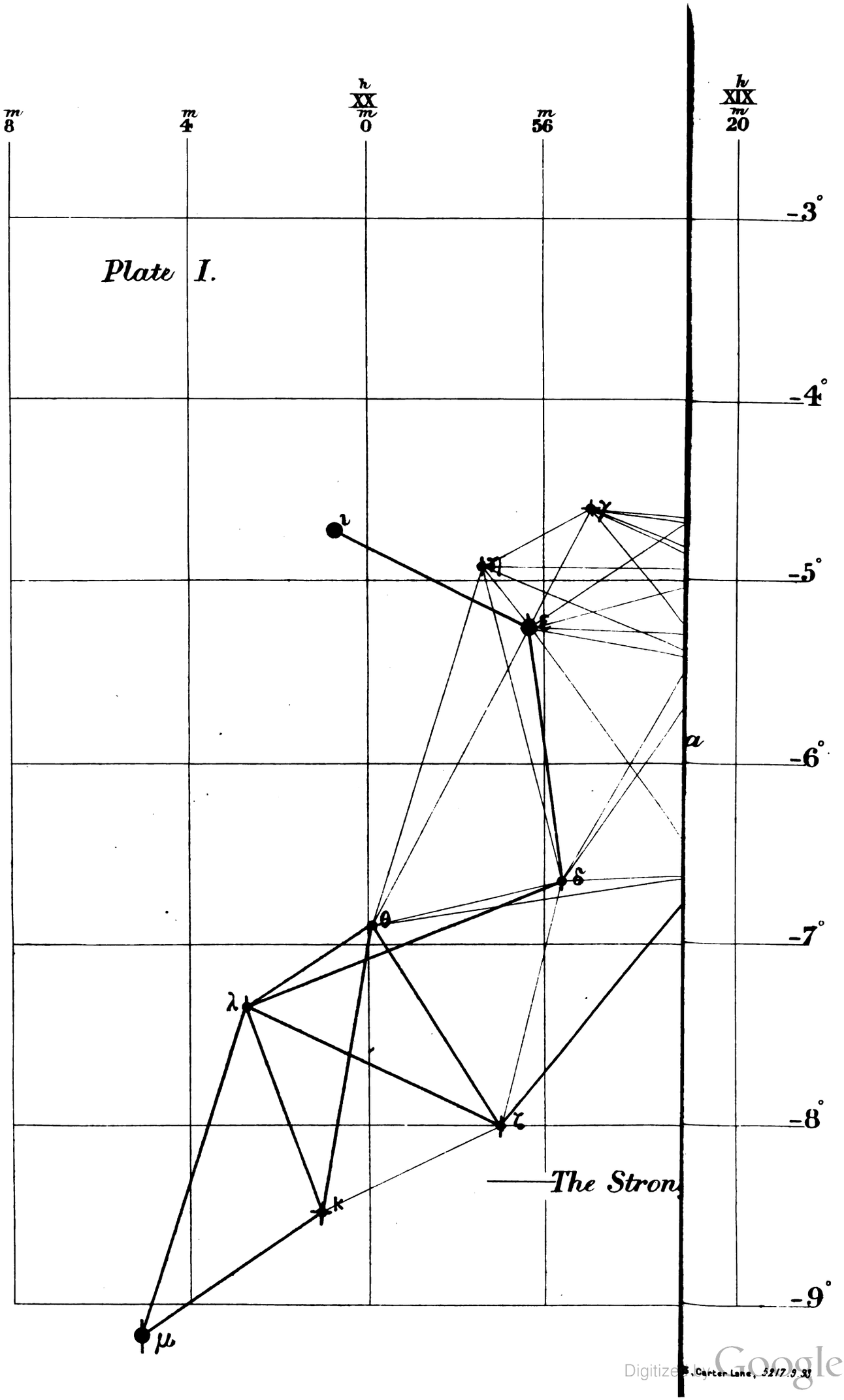

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TRIANGULATION OF THE VICTORIA COMPARISON STARS.

CHAPTER I.

Plan of the Work.

In the programme originally prepared for strengthening the results of the meridian observations of the Victoria Comparison Stars, it was proposed to connect with the surrounding stars (by Heliometer measures of distance and position angle) those stars which were set down in the Victoria-Heliometer-programme for most frequent observation with the planet. It became afterwards desirable to modify this plan on account of the following considerations :—

1. The statistics of the Heliometer-observations of Victoria actually secured in both Hemispheres showed that some of the stars little observed as comparison stars at the Cape were frequently observed in the Northern Hemisphere, and *vice versa*. For example :—

Star *u*, 26 pointings in Southern Hemisphere, 168 in Northern.
" ζ, 56 " " " 0 " "

This dissymmetry arose not from want of adhesion to the original scheme on the part of the observers, but from interruptions by cloudy weather. Obviously, to prevent undue dissymmetry in the results, the places of such stars should be determined with additional precision.

2. It was found by preliminary observations for the triangulation (made in September 1889, in the interval between the observations of *Victoria* and those of *Sappho*), that observations of position angle have less accuracy than those of distance, and occupy about double the time to execute. Thus it becomes possible to determine the relative positions of the stars to each other, with less loss of time and greater accuracy, by observations of distance only, provided—

a. That the stars are relatively situated so as to afford well-conditioned triangles, capable of giving high rigidity to the figure as a whole, from distance-observations only.

b. That there exist independent data for determining the orientation of the figure as a whole.

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3. To fulfil condition *a* it was necessary to introduce two auxiliary stars, viz. :— E = B.D.—6°·5201 and F = B.D.—6°·5294. With the addition of these stars the whole figure becomes geometrically rigid (as will be seen from inspection of Plate I.).

Condition *b* is very rigorously determined by the meridian observations, especially by the Declinations, although the Right Ascensions also contribute to the problem with considerable weight.

In several instances, however, and specially in the case of the stars μ, κ, λ, and ζ, it was necessary (from the otherwise unfavourable geometrical conditions, or for independent control on their positions without introducing further auxiliary stars) to measure position angles as well as distances. Position angles of the pairs ϵ δ, z α, m E, f E, were also desirable to strengthen the independent determination of the Right Ascensions of the stars δ, α, and E (as will be seen by a glance at Plate I.). For obvious reasons it was also necessary to measure the position angle of the pair ϵ ι. With these exceptions, the only observations of position angle which enter into the triangulation are those which were made in 1889 before the revised programme of 1890 was arranged.

4. The next step was to apportion the number of observations in such a way as to secure the rigidity of the figure as a whole in the manner most economical of labour—a problem, the rigorous solution of which is greatly modified by the further condition, viz., that the requisite accuracy in the determination of a star's place may be very different in different directions, and that, as far as is consistent with the first condition, we have to satisfy the second only in so far that the diameter of the ellipse of probable error of the star's position shall be small enough in the direction in which measures of distance from the planet are made, or at right angles to which measures of position angle are made. Thus, for example, if the planet's distance from a particular star is measured at the time when the planet was nearly due N. or S. of it, and at no other time, and if no observations of position angle were made, it would be important to determine the Star's Declination very rigorously, whilst small errors in its Right Ascension would be of no consequence.

The third condition, however, only becomes important in the case of certain stars, because, from many of the stars, distance or position angle of the planet was measured on many occasions and in many different directions.

5. A preliminary inspection of the results of the meridian observations showed that the Declinations were more accurately determined than the Right Ascensions, and provision had to be made in the triangulation for restoring the general balance of accuracy by increasing the strength of the triangulation in Right Ascension.

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6. Keeping all these points in view, and by successive study of the case of each particular star, definitive values of the necessary number of observations (between the limits of 1 and 5) were arrived at by successive approximation, for each distance and position angle in the triangulation.

A rigorous realization of the intended weights was to some extent defeated by a difference, greater than was anticipated, between the weights of long and short distances, but in every case sufficient accuracy for all practical purposes has been realized.

The following Table I. gives the original number of observations requested as one complete series, and the actual numbers obtained.

It will be seen that nearly four complete programme-series have been secured, viz. :—

At the Cape ... ... 2 complete series.
„ Yale ... ... 1 nearly complete series.
„ Göttingen ... ... 1 series, nearly complete, except that no pair was observed more than twice.

and these are divided amongst the observers as follows :—

Cape	Gill ...	...	383	distances	65	position angles.
	Finlay	...	270	„	35	„ „
	Jacoby	...	128	„		
Yale	Chase	...	309	„		
Göttingen ...	Schur	...	127	„		
	Ambronn	...	106	„		
	Total	...	1,323	„	100	„ „

These figures are exclusive of the observations of Standard Stars, of which

Cape ...	Gill	made	166	observations of distance	36	of position angle.
	Finlay	„	112	„ „ „	15	„ „ „
	Jacoby	„	52	„ „ „		
Yale ...	Chase	„	124	„ „ „		
Göttingen...	Schur	„	57	„ „ „		
	Ambronn	„	33	„ „ „		
	Total ...		544	„ „ „	51	„ „ „

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A few observations of position angle were also made at Yale and Göttingen, but they have not been utilized, as they do not afford sufficient data for their complete discussion.

Amongst so many observations there must almost of necessity arise errors, due to some mistake that cannot be traced. The occurrence of such mistakes is minimised by the method of printing (instead of reading) the micrometer head; and where, as in the case of the Cape and Yale observations, the printed records of the micrometer readings are preserved. In some cases the errors can only be explained by the supposition that a wrong pair of stars has been observed. Such cases have not been printed. But there are other cases which appear to have arisen from some mistake such as touching the micrometer-head after the pointing has been made upon the scale, and before the reading has been printed; these are printed in the Table of separate results (Table II.) in brackets and marked rejected. The rule has been adopted of rejecting all observations that are 1″ in error, on the ground that no competent observer should by any possibility be able to commit so large an error in the mean of four pointings except through some mistake. An asterisk in Table I., printed beside the number of observations of a particular pair, indicates that one of the observations has been rejected on the above grounds. Two asterisks indicate that two observations have been rejected. A dagger (†) indicates that in one of the observations a wrong pair of stars was observed.

TABLE I.

List of Observations of Distance requested and obtained in the Triangulation.

Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.						Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.					
			Cape.			Yale.	Göttingen.					Cape.			Yale.	Göttingen.	
			Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.				Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
1	f n	3	3	2	1	3	1	...	12	t F	2	2	2	...	2	...	1
2	f c	1	2	1	...	1	...	1	13	θ η	2	2	2	...	...	2	..
3	p s	2	2	2	...	2	1	1	14	θ κ	2	2	2	...	...	2	...
4	p l	1	1	1	...	1	...	1	15	λ θ	2	2	2	...	...	2	...
5	q o	2	2	2	...	2	2	...	16	λ κ	4	5	4	...	2	2	...
6	q t	3	3	3	...	3	2	...	17	m k	2	2	2	...	2	2	...
7	e c	2	3	1	...	2	2	...	18	m n	2	2	2	...	2	2	...
8	e E	3	4	2	...	3	...	1	19	z x	2	2	2	...	2	2	...
9	d a	2	2	2	...	4	2	...	20	z ε	2	2	2	...	2	2	...
10	d e	2	3	2	1	3	...	1	21	x s	2	2	2	...	2	...	1
11	t r	3	2	4	...	3	2	...	22	x ε	4	4	4	...	...	...	2

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TABLE I.—*continued.*

Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.						Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.					
			Cape.			Yale.	Göttingen.					Cape.			Yale.	Göttingen.	
			Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.				Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
23	k l	1	1	1	1	1	...	1	64	θ δ	2	2	1	1	2	2	...
24	k i	1	1	1	1	1	...	1	65	θ ζ	2	2	1*	1	2	2	...
25	y x	1	1	1	1	1	...	1	66	λ μ	4	5†	2	1	3	2	...
26	y γ	1	1	1	1	1	...	1	67	λ ζ	4	6	3	...	2	2	...
28	δ ζ	2	2	1	1*	3*	...	1†	68	m o	1	1	1	1	1	1	...
29	ε γ	1	2	1	1	1	...	1	69	m i	1	2	1	1	1	1	...
30	ε θ	2	2	2	...	2	2	...	70	μ κ	4	6	2	1	3	2	...
31	ζ α	3	5	3	...	2	...	1	71	z α	2	3	2	2	2	...	...
32	ζ κ	4	4	4	...	2	...	2	72	z w	2	2	2	2	2	...	...
33	g c	1	1	1	1	2	...	1*	73	x α	2	2	1	1	2	...	1
34	g k	1	1	1	1	1	...	1	74	x w	2	2	2	...	2	...	2
35	E b	2	2	2	...	1	...	1	75	k n	1	1	1	1	1	...	1
36	E n	3	3	2	1	3	...	1	76	k h	1	1	1	1	2	...	1
37	F s	4	5	3	...	3	...	1	77	y α	1	2	1	...	1	...	1
38	F α	4	5	3	...	4	...	1	78	y β	1	1	1	1	1	...	1
39	s n	4	5	2	...	3	1	...	79	δ η	1	2	1	...	1	...	1
40	s w	2	2	2	...	2	...	1	80	δ α	2	2	1	1	3†	...	1
41	r o	2	2	2	...	2	1	...	81	ε ι	2	1	2	1	2	...	1
42	r w	2	2	2	...	3	...	1	82	ε β	1	2	1	...	1	...	1
43	γ β	2	2	2	1	1	...	1	83	g n	1	2	1	...	1	...	1
44	γ η	1	1	1	1	1	...	1	84	g l	1	2	1	...	1	...	1
45	w β	2	3†	1	...	1	...	1	85	E m	3	3	2	1	3	...	1
46	w v	2	2	2	...	2	...	1	86	E c	2	2	2	...	2	...	1
47	n i	1	2	1	...	1	...	1	87	F z	2	3†	1	1	2	...	1
48	n o	2	2	2	...	2	...	1	88	F v	2	2	1	..	2	...	1
49	i h	1	3	1	...	1	...	1	89	s v	2	2	2	...	1	1	...
50	b c	2	2	2	...	2	...	1	90	s r	2	2	2	...	2	1	...
51	b a	2	3	1	...	2	...	1	91	γ w	2	2	1	1	2	...	1
52	f i	1	1	1	1	1	1	...	92	n h	1	1	1	1	1	...	1
53	f a	1	3	1	...	2	...	1	93	a c	2	2	1	1	3	...	1
54	p q	3	4	2	...	3	1	1	94	v u	2	2	1	1	2	...	1
55	p k	3	1	2	2	2	1	1	95	f m	5	5	4	2	3	1	...
56	q s	3	3	2	1	3	1	1	96	f l	1	2	1	1*	1	...	1
57	q r	3	3	2	1	3	2	...	97	p u	1	1	1	1	...	...	1
58	e i	1	2	1	1	1	1	...	98	p o	2	2	1	1	2	1	1
59	e a	1	1	1	1	2	1	...	99	q v	5	5	4	1	5**	1	1
60	d m	3	3	2	1	3	2	...	100	q m	5	6†	4	1	5*	2	...
61	d b	1	1	1	1	2	2	...	101	e k	1	2	1	2	...	1	...
62	t v	2	2	1	1	2	2	...	102	e b	1	1	1	1	2	1	...
63	t s	3	3	2	1	3	2	...	103	d i	1	1	1	1	1*	1	...

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TABLE I.—*continued.*

Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.						Reference Number.	Stars composing the pair.	No. of Observations requested.	No. of Observations obtained.					
			Cape.			Yale.	Göttingen.					Cape.			Yale.	Göttingen.	
			Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.				Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
104	t x	2	2	1	1	2	2	...	144	m h	1	1	1	1	1	1	...
105	λ δ	3	5	3	1	2	2	...	145	z η	1	1	1	1	1	1	...
106	m l	1	1	1	1	1	1	...	146	x u	2	2	1	1	2	1	1
107	z δ	2	2	1	1	1	...	1†	147	y ε	1	1	1	1	1	...	1
108	z γ	1	1	1	1	1	1	...	148	ε α	2	2	1	1	2	...	1
109	x γ	1	1	1	2	1	...	1	149	g h	1	1	1	1	2	1	...
110	k o	2	2	1	1	1	1	1	150	E k	1	1	1	1	1	...	1
111	y δ	1	1	1	1	...	...	1†	151	F y	1	1	1	1	1	...	1
112	y w	1	1	1	1	1	...	1	152	f o	2	1	2	1	2	1	...
115	g i	1	1	1	1	1	...	1	153	p h	1	1	1	1	1	...	1
116	E i	1	1	1	1	1	...	1	154	q n	3	3	2	1	3	2	...
117	F x	2	1	2	1	2	...	1	155	e g	1	1	1	1	1	1	...
118	s u	2	2	1	1	2	1	...	156	d c	2	2	1	1	2	2	...
119	r v	2	2	1	1	2	...	1	157	m c	1	1	1	1	1	1	...
120	w u	2	2	1	1	2	...	1	158	z v	5	5	4	1	5	1	1
122	f e	3	4	2	1	3	...	1	159	x v	2	2	1	1	2	1	1
124	q w	2	4	1	1	...	1	1	160	y u	1	1	1	1	1	...	1
125	e h	1	1	1	1	1	1	...	161	ε δ	2	4	2	2	1	...	2
126	d k	1	1	1	1	1	1	...	162	E g	1	1	1	1	1	...	1
127	t w	2	2	1	1	2	2	...	163	F u	2	2	1	1	2	...	1
128	m g	1	1	1	1	1	1	...	164	f k	3	4	2	1	3	2	...
129	z β	1	1	1	1	1	1	...	165	p i	1	1	1	1	1	...	1
130	x β	1	1	1	1	1	...	1	166	e d	2	2	1	1	2	2	...
131	k c	1	1	1	1*	1	...	1	167	θ α	4	4	3	1	4	2	...
132	y v	2	2	1	1	2	1*	...	168	z y	1	1	1	1	1	1	...
133	ε η	1	1	1	1	1	...	1	169	y η	2	2	1	1	2	...	1
134	g o	1	1	1	1	1	...	1	170	e f	3	2	3	1	3	...	1
135	E h	1	1	1	1	1	...	1	171	f h	1	1	2	1	1	1	...
136	F w	2	3	1	1	2	...	1	172	f d	3	3	2	1	3	1	1
137	r u	2	2	1	1	1	...	1	173	p m	5	6	3	1	2	1	1
138	f b	2	2	1	1	2*	...	1	174	p n	4	4	3	1*	4	...	...
139	p r	3	3	2	1	3	1	1	175	d g	1	1	1	1	...	1	...
140	q u	2	2	1	1	2	1	1	176	f g	1	2	1	1	1	...	1
141	e m	5	5	4	1	5	2	...	177	p g	1	1	1	1†	1	...	1
142	d h	1	1	1	1	1	1	...	β^1 & β^2	...	...	2	...	...	...	...	...
143	t u	2	1	1	1	2	2	...									

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7. The conditions to be realized in the reduction and discussion of the observations are the following :—

α. The absolute scale-value and the orientation of the figure as a whole must depend on the meridian observations.

β. The meridian observations must be finally corrected in R.A. for outstanding errors depending on magnitude before they are introduced into the general equations.

γ. The weight of each class of observations must be determined as rigorously as possible, and all the observations be combined (with due regard to their respective weights) in order to derive the most probable relative co-ordinates of the stars.

It is only necessary at the outset to consider the first of these conditions, viz., α, and to provide in the programme of observations means to insure rigid compliance with it.

Heliometer observations of distance, in their most refined sense, cannot be considered absolute measures of angles. The scale-value of the instrument depends upon many conditions, most of which are variable, and it may be desirable briefly to consider these conditions.

Essentially the scale-value depends on the relation of the focal length of the object-glass to the length of the unit of the scale. This, however, is only true if the eye-piece is rigorously focussed on the star's image for the instantaneous condition of the focus of the observer's eye. A displacement of the eye-piece from the true focus towards the object-glass, *by an amount which cannot be appreciated* in the sharpness of the image, requires, in the measurement of large angles, a *sensible* re-adjustment of the separation of the segments—that is to say the segments must be brought sensibly closer together in order to reproduce exact coincidence of the images ; in other words, the scale-value is increased. Similarly the scale-value is diminished if the eye-piece is withdrawn, towards the observer, from its normal position. For these reasons an observer with the Heliometer is not at liberty to change the focal adjustment during a few hours of continuous work, for by re-focussing he will probably create greater and more uncertain errors than those which he may endeavour to avoid. In practice the observer first focusses his eye-piece on a spider line. In the Cape Heliometer (and other more recent instruments) the eye-piece tube is mounted on a screw with a divided circle, so that a number of estimations of the focal reading on the web can be made, and the focus be then clamped at the mean reading. The Heliometer is then pointed on a close double star, and by means of another adjustment the eye-piece and spider line together are moved towards or from the object-glass, till the image of the double star is seen sharply in focus as well as the spider web, and the focal scale (reading to $0^{mm}\cdot01$) is noted. A number of pointings are made on each of several

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nights, and the focussing sliding-tube is clamped at the mean reading of the focal scale. The spider web is then withdrawn from the centre of the field, so as not to interfere with the measures, and then neither the adjustment of the eye-piece on the web nor of the web relative to the focal plane is disturbed unless changes in the normal adaptation of the observer's eye, or of the relation of the length of the tube to the focal length of the object-glass (due to temperature) are suspected, when a fresh investigation of both adjustments is made.

But, as has been already stated, the eye is tolerant of small changes in the focal adjustment, which sensibly affect the scale-value. These changes may, and do, arise as follows :—

The focal length of the object-glass and the length of the tube are affected by temperature.

The focal length is sensibly different for objects of different colour.

The length of the scale is affected by temperature.

The state of adaptation of the observer's eye is dependent on his state of health, or on a condition of greater or less fatigue, or on the inclination of the head in consequence of the altitude of the object observed.

The temperature of the object-glass, of the scale, and of the tube, cannot be assumed to be identical.

Practically, therefore, we cannot assume with any certainty that the instantaneous scale-value of the Heliometer is known, or that it is a function of the temperature. Of course for many purposes mean conditions may be adopted, and mean scale-values be found which are applicable with considerable precision to small angles, or to comparatively crude observations of large distances, but the highest refinement is lost unless means are provided for determining the scale-value for each observer at each epoch of observation. Accordingly the angle between the stars t and p was adopted as the standard distance. This standard distance was measured on every night by each observer, the complete programme being :—

Standard stars	4 pointings (2 in each position of the segments).			
4 pairs of stars in the triangulation, each	4	,,	,,	,,
Standard stars	4	,,	,,	,,
4 pairs of stars in the triangulation, each	4	,,	,,	,,
Standard stars	4	,,	,,	,,

or a total of 44 pointings which, in favourable observing conditions, can be secured in about two hours.

8. If now all the observations of a particular observer are reduced with some assumed approximate scale-value, and the resulting distances in arc are corrected for

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refraction, aberration, &c., to a common mean epoch, we obtain for a pair of stars whose true distance is σ, a series of distances σ_1, σ_2, σ_3 for the different nights on which that pair of stars was observed.

Suppose also that, with the observations σ_1, σ_2 and σ_3 made on different days, the same observer has *simultaneously* obtained corresponding measures of the Standard stars which, similarly reduced, with the same scale-value, give the distances Σ_1, Σ_2 and $_3$ respectively.

If we further assume any approximately true value in seconds of arc $= \Sigma_0$ for the standard distance; then, subject to the accidental errors of observation, and to the error of the adopted value of Σ_0, the true values of the observed distances σ_1, σ_2 and σ_3 will be respectively :—

$$\sigma_1 + \frac{\sigma}{\Sigma_0}(\Sigma_0 - \Sigma_1)$$

$$\sigma_2 + \frac{\sigma}{\Sigma_0}(\Sigma_0 - \Sigma_2)$$

$$\sigma_3 + \frac{\sigma}{\Sigma_0}(\Sigma_0 - \Sigma_3)$$

in which a small error in the adopted value of $\frac{\sigma}{\Sigma_0}$ has no sensible influence on the results.

Observations thus reduced will be all strictly comparable, and be all subject to a small common final correction for scale-value due to any error in the assumed value of Σ_0. But unless the observation of each pair of stars in the triangulation has been included closely and symmetrically between two observations of the Standard stars, the observations in the triangulation cannot be regarded as strictly simultaneous with those of the Standards. An attempt to modify the programme so as rigorously to satisfy these conditions would have nearly doubled the work and rendered it impossible to complete the observations in 1890.

9. There remains therefore the question how should the correction $\frac{\sigma}{\Sigma^0}(\Sigma_0 - \Sigma)$ be derived :—

I. Should the mean of the three values of $(\Sigma_0 - \Sigma)$ for each complete night's work be adopted ? or

II. Should the values of $(\Sigma_0 - \Sigma)$ be interpolated by means of a curve drawn through points on a diagram of which the ordinate and the abcissa are the sidereal time and the corresponding observed value of $(\Sigma_0 - \Sigma)$?

If the variations of $(\Sigma_0 - \Sigma)$ depend chiefly on accidental errors of pointing, then the first method should be adopted, but if the variations of $(\Sigma_0 - \Sigma)$ depend chiefly on true changes of scale-value, the second method must be preferable. It will be most satisfactory in the first place to reduce the observations in both ways, and then determine the definitive method after discussion of the results.

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CHAPTER II.

Observations of the Standard Stars for Scale-value.

For reasons explained in last chapter, it is necessary, as a preliminary step, to reduce the observations of the Standard stars. The results are given in the following Table II. :—

Column 1 gives the Rotation Number. All observations with the same instrument, and connected with the triangulation, are numbered in direct rotation.

Column 2 gives the date of observation.

Column 3 indicates the observer. G = Gill, F = Finlay, J = Jacoby, C = Chase, S = Schur, An = Ambronn.

Column 4. The local sidereal time.

Column 5. The observed distance, that is to say the combined scale and screw readings are converted into seconds of arc (a uniform approximate scale-value is used throughout for the results of each instrument).

Column 6. The correction for refraction. In computing this correction Mr. Harold Jacoby's Tables for differential refraction were employed for the observations at the Cape and Göttingen ; those for Yale were independently computed by Dr. Elkin. The factor depending on the readings of the Barometer and Thermometer was computed for the epochs of observation of the Meteorological Instruments, and was then interpolated for the epoch of each Heliometer observation. In general the Barometer and Thermometer were read at the beginning, middle, and end of a set of observations.

Column 7 gives the correction required on account of Aberration to reduce to mean distance.

Column 8 is the mean distance, or the sum of columns 5, 6, and 7.

Column 9 gives the value of $(\Sigma_0 - \Sigma)$ for each observation, Σ_0 being assumed $= 6456''\cdot6$, a value which was derived from a preliminary reduction of a few of the series of meridian observations.

Column 10 gives the mean value of $(\Sigma_0 - \Sigma)$ for each set of observations.

The standard stars are S.D.M. $-$ 4°·4883 and $-$ 4°·4926, named p and t respectively in the chart of the triangulation (Plate I.).

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TABLE II.

Measures of the Standard Stars in Distance.—Cape Observations.

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1889.			h	m	″	″	″	″	″	″
1	September	1	G	18	7·4	6454·565	2·000	— ·424	6456·141	+ 0·459	+ 0·459
6	September	2	G	17	26·3	6454·479	2·313	— ·431	6456·361	+ 0·239	+ 0·396
9		2	G	18	26·7	4·555	1·923	— ·431	6·047	+ 0·553	
10	September	3	G	17	27·1	6454·067	2·313	— ·438	6455·942	+ 0·658	+ 0·717
15		3	G	18	30·3	4·358	1·904	— ·438	5·824	+ 0·776	
18	September	3	G	21	35·0	6454·309	2·474	— ·438	6456·345	+ 0·255	+ 0·122
26		3	G	23	20·1	1·553	5·496	— ·438	6·611	— 0·011	
28	September	6	G	17	38·9	6454·732	2·188	— ·460	6456·460	+ 0·140	+ 0·196
34		6	G	18	56·2	4·963	1·845	— ·460	6·348	+ 0·252	
36	September	6	G	21	22·5	6454·340	2·348	— ·460	6456·228	+ 0·372	+ 0·369
44		6	G	22	58·8	2·263	4·430	— ·460	6·233	+ 0·367	
46	September	8	G	17	45·9	6454·484	2·151	— ·473	6456·162	+ 0·438	+ 0·510
52		8	G	18	55·8	4·646	1·844	— ·473	6·017	+ 0·583	
54	September	8	G	21	18·4	6453·659	2·287	— ·473	6455·473	+ 1·127	+ 1·127
60	September	10	G	18	3·4	6454·667	2·036	— ·487	6456·216	+ 0·384	+ 0·384
64	September	10	G	21	13·7	6454·303	2·184	— ·487	6456·000	+ 0·600	+ 0·600
72	September	11	G	21	19·5	6454·288	2·299	— ·493	6456·094	+ 0·506	+ 0·284
80		11	G	22	53·4	2·819	4·212	— ·493	6·538	+ 0·062	
	1890.										
83	April	12	F	15	22·0	6449·322	6·818	+ ·612	6456·752	— 0·152	+ 0·044
88		12	F	16	40·3	52·722	3·026	+ ·612	6·360	+ 0·240	
91	April	13	J	16	18·1	6450·127	3·629	+ ·612	6454·368	+ 2·232	+ 2·232
93	April	15	F	15	50·6	6451·447	4·600	+ ·611	6456·658	— 0·058	— 0·005
98		15	F	17	30·4	4·145	2·224	+ ·611	6·980	— 0·380	
101		15	F	18	31·1	3·711	1·855	+ ·611	6·177	+ 0·423	
102	April	16	J	16	12·0	6449·799	3·684	+ ·610	6454·093	+ 2·507	+ 2·186
107		16	J	17	35·0	51·947	2·179	+ ·610	4·736	+ 1·864	
109	April	17	G	16	25·9	6452·656	3·260	+ ·610	6456·526	+ 0·074	— 0·080
114		17	G	17	36·3	4·077	2·147	+ ·610	6·834	— 0·234	
115	April	25	J	14	58·3	6443·399	10·143	+ ·601	6454·143	+ 2·457	+ 2·262
120		25	J	16	26·9	50·617	3·315	+ ·601	4·533	+ 2·067	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
121	April	26	G	16	8·6	6451·965	3·924	+ ·600	6456·489	+ 0·111	+ 0·111
124	April	28	J	14	50·2	6441·751	11·872	+ ·596	6454·219	+ 2·381	
129		28	J	15	52·3	49·548	4·601	+ ·596	4·745	+ 1·855	+ 1·967
134		28	J	16	38·2	51·272	3·067	+ ·596	4·935	+ 1·665	
135	April	29	G	15	0·7	6446·003	9·578	+ ·593	6456·174	+ 0·426	
136		29	G	15	11·2	47·934	7·959	+ ·593	6·486	+ 0·114	
141		29	G	16	8·0	51·452	3·894	+ ·593	5·939	+ 0·661	+ 0·412
146		29	G	17	2·3	53·089	2·610	+ ·597	6·296	+ 0·304	
147	April	30	F	15	14·6	6449·074	7·472	+ ·594	6457·140	— 0·540	
148		30	F	15	21·9	49·914	6·667	+ ·594	7·175	— 0·575	
153		30	F	16	22·5	52·791	3·407	+ ·594	6·792	— 0·192	— 0·289
158		30	F	17	23·0	53·797	2·327	+ ·594	6·718	— 0·118	
159	May	2	G	15	15·9	6448·929	7·393	+ ·588	6456·910	— 0·310	
160		2	G	15	22·5	49·347	6·692	+ ·588	6·627	— 0·027	
165		2	G	16	29·3	53·167	3·253	+ ·588	7·008	— 0·408	— 0·164
170		2	G	17	36·6	53·720	2·207	+ ·588	6·515	+ 0·085	
171	May	3	F	15	25·0	6449·875	6·439	+ ·585	6456·899	— 0·299	
176		3	F	16	27·0	52·864	3·288	+ ·585	6·737	— 0·137	— 0·262
181		3	F	17	43·2	54·241	2·125	+ ·585	6·951	— 0·351	
182	May	9	F	15	19·1	6448·497	7·211	+ ·562	6456·270	+ 0·330	
187		9	F	16	19·9	52·745	3·595	+ ·562	6·902	— 0·302	— 0·005
192		9	F	17	12·2	53·548	2·533	+ ·562	6·643	— 0·043	
194	May	10	J	15	48·5	6449·125	4·834	+ ·558	6454·517	+ 2·083	+ 2·019
199		10	J	17	24·2	51·746	2·342	+ ·558	4·646	+ 1·954	
202	May	13	J	16	0·1	6450·041	4·259	+ ·546	6454·846	+ 1·754	+ 1·483
207		13	J	17	16·3	2·413	2·429	+ ·546	5·388	+ 1·212	
210	May	17	F	15	25·1	6449·739	6·454	+ ·524	6456·717	— 0·117	— 0·117
212	May	18	J	15	34·3	6448·655	5·803	+ ·519	6454·977	+ 1·623	+ 1·623
216	May	21	J	15	40·9	6448·890	5·312	+ ·503	6454·705	+ 1·895	+ 1·515
221		21	J	16	39·3	52·725	2·238	+ ·503	5·466	+ 1·134	
222	May	22	G	16	12·2	6452·311	3·748	+ ·497	6456·556	+ 0·044	
223		22	G	16	18·9	2·683	3·533	+ ·497	6·713	— 0·113	
228		22	G	17	13·5	4·004	2·445	+ ·497	6·946	— 0·346	— 0·247
232		22	G	18	1·5	4·221	2·017	+ ·497	6·735	— 0·135	
233		22	G	18	5·9	4·688	1·992	+ ·497	7·177	— 0·577	
234	May	24	J	15	45·4	6452·768	5·054	+ ·485	6458·307	rejected*	
236		24	J	16	17·1	1·015	3·660	+ ·485	5·160	+ 1·440	+ 1·393
241		24	J	17	31·3	2·474	2·295	+ ·485	5·254	+ 1·346	

* Observed with Gill's reading of eye-piece focus.

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	″	″	″	″	″	″
243	May	27	J	15 53·4	6450·297	4·554	+ ·464	6455·315	+ 1·285	+ 1·000
248		27	J	17 15·4	2·966	2·454	+ ·464	5·884	+ 0·716	
251	May	28	F	15 31·4	6449·806	6·002	+ ·457	6456·265	+ 0·335	·000
257		28	F	17 19·7	54·188	2·406	+ ·457	7·051	− 0·451	
258		28	F	17 32·1	54·082	2·277	+ ·457	6·816	− 0·216	
259	May	29	J	15 22·3	6448·094	6·683	+ ·450	6455·227	+ 1·373	+ 1·443
264		29	J	16 20·4	51·353	3·478	+ ·450	5·281	+ 1·319	
269		29	J	17 12·1	52·056	2·458	+ ·450	4·964	+ 1·636	
270	June	3	F	15 34·0	6450·668	5·766	+ ·416	6456·850	− 0·250	− 0·020
275		3	F	16 45·6	3·028	2·920	+ ·416	6·364	+ 0·236	
279		3	F	17 39·0	4·022	2·208	+ ·416	6·646	− 0·046	
281	June	5	G	15 16·9	6448·864	7·392	+ ·399	6456·655	− 0·055	− 0·104
286		5	G	16 27·6	53·042	3·312	+ ·399	6·753	− 0·153	
287	June	6	F	15 32·6	6450·310	5·859	+ ·391	6456·560	+ 0·040	− 0·067
291		6	F	17 28·2	4·090	2·293	+ ·391	6·774	− 0·174	
293	June	8	G	15 36·8	6450·529	5·518	+ ·375	6456·422	+ 0·178	− 0·006
298		8	G	16 46·6	3·504	2·871	+ ·375	6·750	− 0·150	
303		8	G	17 45·6	4·134	2·137	+ ·375	6·646	− 0·046	
304	June	10	G	21 31·0	6453·885	2·425	+ ·360	6456·670	− 0·070	− 0·070
309	June	11	G	15 20·6	6449·577	6·900	+ ·352	6456·829	− 0·229	+ 0·009
314		11	G	16 10·8	52·261	3·805	+ ·352	6·418	+ 0·182	
319		11	G	17 9·1	53·660	2·513	+ ·352	6·425	+ 0·075	
320	June	11	F	21 35·9	6454·125	2·463	+ ·352	6456·940	− 0·340	− 0·433
326		11	F	23 34·6	0·287	6·487	+ ·352	7·126	− 0·526	
327	June	12	F	15 10·9	6449·774	8·175	+ ·343	6458·292	− 1·692	− 1·732
332		12	F	16 17·3	54·396	3·652	+ ·343	8·391	− 1·791	
338		12	F	17 28·0	55·632	2·337	+ ·343	8·312	− 1·712	
339	June	12	J	21 38·2	6452·344	2·540	+ ·343	6455·227	+ 1·373	+ 1·373
344	June	14	G	16 4·9	6451·961	4·028	+ ·325	6456·314	+ 0·286	− 0·076
349		14	G	17 29·5	4·539	2·276	+ ·325	7·140	− 0·540	
350		14	G	17 40·0	4·069	2·179	+ ·325	6·573	+ 0·027	
351	June	15	J	22 4·4	6451·749	2·871	+ ·316	6454·936	+ 1·664	+ 1·967
355		15	J	23 28·5	48·009	6·006	+ ·316	4·331	+ 2·269	
356	June	16	G	15 46·8	6451·137	4·904	+ ·308	6456·349	+ 0·251	+ 0·105
361		16	G	16 39·5	3·309	3·024	+ ·308	6·641	− 0·041	
366		16	G	17 29·7	3·903	2·285	+ ·308	6·496	+ 0·104	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	″	″	″	″	″	″
367	June	16	J	21 55·2	6451·796	2·755	+ ·308	6454·859	+ 1·741	+ 1·843
372		16	J	23 27·1	48·389	5·958	+ ·308	4·655	+ 1·945	
404	July	4	G	15 57·7	6451·749	4·344	+ ·138	6456·231	+ 0·369	+ 0·223
409		4	G	17 12·1	3·909	2·477	+ ·138	6·524	+ 0·076	
410	July	4	G	22 10·4	6453·152	3·037	+ ·138	6456·327	+ 0·273	+ 0·273
415	July	8	G	23 28·6	6450·312	6·087	+ ·098	6456·497	+ 0·103	+ 0·103
416	July	9	F	21 54·3	6454·246	2·794	+ ·088	6457·128	— 0·528	— 0·515
423		9	F	23 40·8	49·751	7·262	+ ·088	7·101	— 0·501	
424	July	10	G	15 40·7	6450·992	5·295	+ ·078	6456·365	+ 0·235	+ 0·152
429		10	G	16 52·0	3·574	2·795	+ ·078	6·447	+ 0·153	
434		10	G	17 46·5	4·304	2·151	+ ·078	6·533	+ 0·067	
435	July	10	J	21 52·8	6452·312	2·749	+ ·077	6455·138	+ 1·462	+ 1·274
440		10	J	23 8·4	50·137	4·952	+ ·077	5·166	+ 1·434	
443		10	J	0 18·1	42·266	13·330	+ ·077	5·673	+ 0·927	
444	July	11	F	15 31·9	6450·691	5·967	+ ·069	6456·727	— 0·127	+ 0·099
449		11	F	16 32·7	2·998	3·208	+ ·069	6·275	+ 0·325	
450	July	11	G	21 40·5	6453·751	2·569	+ ·067	6456·387	+ 0·213	+ 0·165
455		11	G	22 49·6	2·298	4·119	+ ·067	6·484	+ 0·116	
456	July	12	F	22 6·6	6454·055	2·937	+ ·057	6457·049	— 0·449	— 0·530
461		12	F	23 34·0	0·638	6·516	+ ·057	7·211	— 0·611	
462	July	13	G	15 54·4	6451·863	4·530	+ ·049	6456·442	+ 0·158	+ 0·085
467		13	G	16 48·6	3·544	2·873	+ ·049	6·466	+ 0·134	
472		13	G	17 42·6	4·394	2·193	+ ·049	6·636	— 0·036	
473	July	13	J	22 12·4	6451·599	3·060	+ ·047	6454·706	+ 1·894	+ 1·674
476		13	J	23 45·2	47·538	7·560	+ ·047	5·145	+ 1·455	
477	July	14	F	15 18·8	6449·345	7·078	+ ·039	6456·462	+ 0·138	+ 0·059
482		14	F	16 5·6	52·740	3·995	+ ·039	6·774	— 0·174	
487		14	F	16 54·3	53·613	2·736	+ ·039	6·388	+ 0·212	
490	July	16	J	21 33·2	6455·210	2·506	+ ·016	6457·732	— 1·132*	— 1·132
495	July	16	J	23 6·8	6450·130	4·873	+ ·016	6455·019	+ 1·581	+ 2·089
500		16	J	0 15·8	41·186	12·801	+ ·016	4·003	+ 2·597	
501	July	17	F	15 18·1	6449·251	7·385	+ ·007	6456·643	— 0·043	+ 0·013
507		17	F	16 21·3	53·119	3·589	+ ·007	6·715	— 0·115	
513		17	F	17 13·0	53·846	2·551	+ ·007	6·404	+ 0·196	
516	July	17	G	21 42·6	6453·543	2·655	+ ·006	6456·204	+ 0·396	+ 0·025
521		17	G	22 45·7	2·534	4·062	+ ·006	6·602	— 0·002	
526		17	G	23 32·7	0·272	6·642	+ ·006	6·920	— 0·320	

* Observed with Gill's reading of eye-piece focus.

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	′	″	″	″	″	″
527	July	18	J	15	26·0	6448·133	6·391	— ·003	6454·521	+ 2·079	
532		18	J	16	30·5	52·144	3·231	— ·003	5·372	+ 1·228	+ 1·551
537		18	J	17	15·8	52·823	2·433	— ·003	5·253	+ 1·347	
538	July	19	G	15	41·2	6450·677	5·392	— ·013	6456·056	+ 0·544	+ 0·544
543	July	19	J	21	55·6	6452·364	2·816	— ·013	6455·167	+ 1·433	+ 1·433
546	July	20	F	15	22·0	6449·988	6·896	— ·023	6456·861	— 0·261	
551		20	F	16	13·0	52·963	3·810	— ·023	6·750	— 0·150	— 0·149
556		20	F	17	6·8	54·064	2·596	— ·023	6·637	— 0·037	
557	July	20	G	21	31·5	6453·938	2·478	— ·024	6456·392	+ 0·208	
562		20	G	22	25·4	3·470	3·399	— ·024	6·845	— 0·245	— 0·033
567		20	G	23	20·7	0·952	5·628	— ·024	6·556	+ 0·044	
568		20	G	23	27·5	0·695	6·096	— ·024	6·767	— 0·167	
569	July	21	F	21	28·2	6454·096	2·411	— ·034	6456·473	+ 0·127	
574		21	F	22	47·9	2·935	4·029	— ·034	6·930	— 0·330	— 0·269
575		21	F	23	13·2	2·098	5·141	— ·034	7·205	— 0·605	
577	July	22	G	16	53·5	6453·482	2·813	— ·043	6456·252	+ 0·348	+ 0·350
582		22	G	17	46·4	4·106	2·186	— ·043	6·249	+ 0·351	
584	July	22	J	21	38·4	6452·500	2·554	— ·044	6455·010	+ 1·590	
589		22	J	22	20·3	2·021	3·274	— ·044	5·251	+ 1·349	+ 1·252
594		22	J	22	58·3	1·714	4·452	— ·044	6·122	+ 0·478	
595	July	24	J	15	42·2	6449·479	5·293	— ·063	6454·709	+ 1·891	
600		24	J	16	22·5	52·624	3·534	— ·063	6·095	+ 0·505	+ 0·853
605		24	J	16	54·9	53·691	2·808	— ·063	6·436	+ 0·164	
606	July	24	F	21	42·5	6454·260	2·626	— ·064	6456·822	— 0·222	
611		24	F	22	35·9	3·198	3·701	— ·064	6·835	— 0·235	— 0·419
615		24	F	23	33·9	0·773	6·691	— ·064	7·400	— 0·800	
616	July	25	G	15	50·2	6451·382	4·795	— ·073	6456·104	+ 0·496	
621		25	G	16	54·4	3·899	2·792	— ·073	6·618	— 0·018	+ 0·145
622		25	G	17	0·6	3·959	2·692	— ·073	6·578	+ 0·022	
626		25	G	17	41·0	4·371	2·222	— ·073	6·520	+ 0·080	
627	July	25	J	21	59·6	6456·229	2·875	— ·074	6459·030	— 2·430*	— 2·687
632		25	J	22	43·8	5·687	3·931	— ·074	9·544	— 2·944*	
634		25	J	23	6·1	1·756	4·828	— ·074	6·510	+ 0·090	+ 0·217
637		25	J	23	29·7	0·043	6·287	— ·074	6·256	+ 0·344	
638	July	28	G	16	48·4	6453·636	2·849	— ·104	6456·381	+ 0·219	
643		28	G	17	39·7	4·325	2·199	— ·104	6·420	+ 0·180	+ 0·186
644		28	G	17	45·2	4·425	2·155	— ·104	6·476	+ 0·124	

* Observed with Gill's reading of eye-piece focus.

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	″	″	″	″	″	″
645	August	2	J	16 45·6	6453·034	2·939	— ·154	6455·819	+ 0·781	+ 0·774
649		2	J	17 16·1	3·522	2·464	— ·154	5·832	+ 0·768	
652	August	5	F	15 42·1	6451·644	5·227	— ·183	6456·688	— 0·088	+ 0·092
657		5	F	16 37·1	3·408	3·102	— ·183	6·327	+ 0·273	
660	August	5	F	21 28·9	6454·392	2·411	— ·183	6456·620	— 0·020	— 0·172
665		5	F	22 29·4	3·633	3·474	— ·184	6·923	— 0·323	
667	August	6	G	15 55·9	6452·378	4·416	— ·193	6456·601	— 0·001	+ 0·114
672		6	G	16 45·1	3·780	2·913	— ·193	6·500	+ 0·100	
677		6	G	17 29·2	4·254	2·297	— ·193	6·358	+ 0·242	
678	August	8	G	16 3·1	6452·332	4·155	— ·213	6456·274	+ 0·326	+ 0·262
683		8	G	17 9·6	4·224	2·545	— ·213	6·556	+ 0·044	
688		8	G	17 48·0	4·239	2·157	— ·213	6·183	+ 0·417	
689	August	8	G	20 55·9	6454·648	2·144	— ·214	6456·578	+ 0·022	— 0·407
694		8	G	22 10·4	4·421	3·051	— ·214	7·258	— 0·658	
699		8	G	22 50·0	3·286	4·113	— ·214	7·185	— 0·585	
700	August	9	F	15 49·5	6451·843	4·809	— ·223	6456·429	+ 0·171	+ 0·111
705		9	F	16 31·2	3·679	3·260	— ·223	6·716	— 0·116	
710		9	F	17 11·3	4·012	2·532	— ·223	6·321	+ 0·279	
711	August	9	F	21 35·6	6454·773	2·519	— ·224	6457·068	— 0·468	— 0·468
714	August	12	F	16 52·3	6454·109	2·854	— ·251	6456·712	— 0·112	— 0·112
716	August	13	G	16 3·0	6452·671	4·197	— ·260	6456·608	— 0·008	— 0·022
721		13	G	16 38·5	3·938	3·107	— ·260	6·785	— 0·185	
726		13	G	17 17·7	4·274	2·460	— ·260	6·474	+ 0·126	
727	August	13	G	20 44·4	6454·898	2·079	— ·261	6456·716	— 0·116	— 0·311
732		13	G	21 21·6	4·887	2·368	— ·261	6·994	— 0·394	
737		13	G	22 1·3	4·390	2·895	— ·261	7·024	— 0·424	
740	August	14	F	16 6·0	6452·620	4·037	— ·269	6456·388	+ 0·212	+ 0·097
746		14	F	17 27·1	4·549	2·338	— ·269	6·618	— 0·018	
747	August	15	G	16 21·2	6453·425	3·492	— ·278	6456·639	— 0·039	+ 0·055
752		15	G	17 16·5	4·460	2·427	— ·278	6·609	— 0·009	
755		15	G	17 42·2	4·490	2·174	— ·278	6·386	+ 0·214	
758	August	15	F	20 56·1	6455·268	2·110	— ·279	6457·099	— 0·499	— 0·506
764		15	F	22 5·6	4·482	2·910	— ·279	7·113	— 0·513	
766	August	16	F	16 54·7	6454·408	2·758	— ·287	6456·879	— 0·279	— 0·067
771		16	F	17 59·3	4·669	2·072	— ·287	6·454	+ 0·146	
772	August	17	G	16 15·9	6453·007	3·695	— ·297	6456·405	+ 0·195	+ 0·151
778		17	G	17 11·1	4·310	2·529	— ·297	6·542	+ 0·058	
783		17	G	17 47·2	4·530	2·168	— ·297	6·401	+ 0·199	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
785	August	17	G	20	27·4	6455·014	1·950	— ·298	6456·666	— 0·066	
790		17	G	21	4·8	4·781	2·171	— ·298	6·654	— 0·054	— 0·036
795		17	G	21	46·7	4·285	2·602	— ·298	6·589	+ 0·011	
798	August	19	G	16	20·3	6452·952	3·523	— ·315	6456·160	+ 0·440	
803		19	G	17	8·3	4·365	2·543	— ·315	6·593	+ 0·007	+ 0·225
807		19	G	17	41·8	4·506	2·180	— ·315	6·371	+ 0·229	
810	August	19	G	20	32·2	6454·898	1·962	— ·316	6456·544	+ 0·056	
815		19	G	21	17·9	4·577	2·265	— ·316	6·526	+ 0·074	— 0·046
820		19	G	22	6·8	4·084	2·907	— ·316	6·675	— 0·075	
821		19	G	22	11·9	4·370	3·007	— ·316	7·061	— 0·461	
824	August	20	F	17	10·9	6454·478	2·478	— ·323	6456·633	— 0·033	+ 0·126
828		20	F	17	58·5	4·594	2·044	— ·323	6·315	+ 0·285	
830	August	20	G	20	39·2	6454·902	1·995	— ·324	6456·573	+ 0·027	
835		20	G	21	19·6	4·716	2·304	— ·324	6·696	— 0·096	— 0·043
840		20	G	22	2·5	4·173	2·837	— ·324	6·686	— 0·086	
841		20	G	22	6·2	4·057	2·901	— ·324	6·634	— 0·034	
842	August	21	G	21	11·8	6454·485	2·271	— ·332	6456·424	+ 0·176	
847		21	G	21	58·0	4·164	2·833	— ·332	6·665	— 0·065	— 0·036
852		21	G	22	42·4	3·288	3·863	— ·332	6·819	— 0·219	
853	August	25	G	17	2·8	6454·058	2·620	— ·364	6456·314	+ 0·286	+ 0·180
858		25	G	17	55·7	4·807	2·082	— ·364	6·425	+ 0·075	
859	August	25	G	20	48·4	6455·095	2·064	— ·365	6456·794	— 0·194	
864		25	G	21	30·1	4·546	2·407	— ·365	6·588	+ 0·012	— 0·103
869		25	G	22	19·3	3·902	3·191	— ·365	6·728	— 0·128	
870	August	26	F	16	58·9	6454·244	2·640	— ·372	6456·512	+ 0·088	+ 0·136
873		26	F	17	59·4	4·763	2·026	— ·372	6·417	+ 0·183	
874	August	26	G	21	5·4	6454·888	2·146	— ·373	6456·661	— 0·061	— 0·105
879		26	G	22	3·4	4·296	2·826	— ·373	6·749	— 0·149	
880	August	28	G	17	10·3	6454·528	2·530	— ·390	6456·668	— 0·068	
885		28	G	17	48·0	4·923	2·151	— ·390	6·684	— 0·084	— 0·097
888		28	G	18	15·0	5·140	1·988	— ·390	6·738	— 0·138	
891	August	28	G	21	5·0	6454·702	2·191	— ·391	6456·502	+ 0·098	
896		28	G	21	43·7	4·908	2·588	— ·391	7·105	— 0·505	— 0·250
901		28	G	22	26·7	3·952	3·383	— ·391	6·944	— 0·344	
904	August	29	F	17	3·0	6454·103	2·620	— ·398	6456·325	+ 0·275	— 0·109
909		29	F	17	54·2	5·395	2·096	— ·398	7·093	— 0·493	
912	August	29	F	21	4·3	6455·040	2·193	— ·399	6456·834	— 0·234	— 0·480
919		29	F	22	32·2	4·181	3·545	— ·399	7·327	— 0·727	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
920	August	31	G	17	11·9	6454·289	2·510	— ·413	6456·386	+ 0·214	+ 0·126
925		31	G	17	51·2	4·847	2·129	— ·413	6·563	+ 0·037	
927	August	31	G	20	54·3	6454·793	2·114	— ·414	6456·493	+ 0·107	— 0·021
932		31	G	21	31·1	4·727	2·436	— ·414	6·749	— 0·149	
933	September	1	F	17	8·0	6454·117	2·522	— ·421	6456·218	+ 0·382	+ 0·459
938		1	F	17	48·5	4·367	2·118	— ·421	6·064	+ 0·536	
941	September	1	F	21	10·1	6454·964	2·219	— ·422	6456·761	— 0·161	— 0·110
946		1	F	22	16·0	5·961	3·120	— ·422	6·659	— 0·059	
949	September	3	F	17	22·8	6455·225	2·289	— ·435	6457·079	— 0·479	— 0·188
952		3	F	17	58·8	4·933	1·999	— ·435	6·497	+ 0·103	
953	September	3	F	21	16·5	6455·295	2·209	— ·436	6457·068	— 0·468	— 0·417
960		3	F	22	49·8	3·428	3·974	— ·436	6·966	— 0·366	
961	September	5	F	21	16·1	6454·999	2·284	— ·451	6456·832	— 0·232	— 0·450
966		5	F	22	53·2	3·513	4·206	— ·451	7·268	— 0·668	
967	September	9	F	17	47·5	6454·684	2·125	— ·477	6456·332	+ 0·268	+ 0·300
971		9	F	18	22·7	4·819	1·925	— ·477	6·267	+ 0·333	
972	September	9	F	21	0·7	6455·315	2·125	— ·478	6456·962	— 0·362	— 0·420
977		9	F	21	47·7	4·954	2·601	— ·478	7·077	— 0·477	
979	September	10	G	21	20·0	6454·549	2·286	— ·484	6456·351	+ 0·249	+ 0·103
984		10	G	22	57·7	2·821	4·307	— ·484	6·644	— 0·044	
985	September	18	G	20	36·1	6454·742	1·970	— ·531	6456·181	+ 0·419	+ 0·089
990		18	G	21	43·5	4·369	2·534	— ·531	6·372	+ 0·228	
995		18	G	22	39·7	3·831	3·679	— ·531	6·979	— 0·379	
996	September	21	G	20	40·0	6454·783	2·033	— ·546	6456·270	+ 0·330	+ 0·230
1001		21	G	21	47·7	4·356	2·660	— ·546	6·470	+ 0·130	
1003	September	23	G	20	43·5	6454·933	2·038	— ·556	6456·415	+ 0·185	+ 0·262
1008		23	G	21	30·1	4·405	2·412	— ·556	6·261	+ 0·339	
1009	September	26	G	20	53·5	6455·290	2·060	— ·568	6456·782	— 0·182	— 0·213
1014		26	G	21	44·1	4·757	2·540	— ·568	6·729	— 0·129	
1019		26	G	22	39·7	3·817	3·679	— ·568	6·928	— 0·328	
1020	September	27	G	20	57·6	6454·721	2·089	— ·572	6456·238	+ 0·362	+ 0·362
1022	September	29	G	21	1·5	6454·505	2·131	— ·579	6456·057	+ 0·543	+ 0·186
1027		29	G	21	57·9	4·308	2·760	— ·579	6·489	+ 0·111	
1032		29	G	22	46·6	3·205	4·069	— ·579	6·695	— 0·095	
1033	October	2	F	20	50·8	6454·970	2·081	— ·591	6456·460	+ 0·140	+ 0·100
1037		2	F	21	47·6	4·508	2·624	— ·591	6·541	+ 0·059	
1038	October	3	G	21	29·9	6454·588	2·399	— ·593	6456·394	+ 0·206	+ 0·206

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
1041	October	4	F	21	9·0	6454·774	2·184	— ·595	6456·363	+ 0·237	
1048		4	F	22	39·5	3·618	3·673	— ·595	6·696	— 0·096	— 0·006
1048(*a*)		4	F	22	46·6	3·462	3·893	— ·595	6·760	— 0·160	
1049	October	6	F	21	4·3	6454·487	2·185	— ·598	6456·074	+ 0·526	+ 0·176
1054		6	F	22	15·7	4·226	3·146	— ·598	6·774	— 0·174	
1055	October	7	G	21	1·5	6454·807	2·176	— ·600	6456·383	+ 0·217	
1060		7	G	21	47·7	4·662	2·658	— ·600	6·720	— 0·120	— 0·155
1065		7	G	22	31·8	3·844	3·540	— ·600	6·784	— 0·184	
1070		7	G	23	16·2	2·409	5·325	— ·600	7·134	— 0·534	
1071	October	8	F	20	37·9	6455·009	2·003	— ·603	6456·409	+ 0·191	— 0·108
1076		8	F	21	50·2	4·944	2·665	— ·603	7·006	— 0·406	
1079	October	9	G	20	56·6	6454·893	2·112	— ·605	6456·400	+ 0·200	
1084		9	G	21	43·4	4·250	2·557	— ·605	6·202	+ 0·398	+ 0·051
1089		9	G	22	32·6	3·823	3·499	— ·605	6·717	— 0·117	
1094		9	G	23	16·9	2·239	5·239	— ·605	6·873	— 0·273	
1095	October	10	F	20	44·0	6455·045	1·992	— ·606	6456·431	+ 0·169	+ 0·399
1099		10	F	22	39·5	2·944	3·634	— ·606	5·972	+ 0·628	
1100	October	11	G	20	46·6	6455·180	2·018	— ·607	6456·591	+ 0·009	
1105		11	G	21	35·7	4·516	2·434	— ·607	6·343	+ 0·257	+ 0·082
1110		11	G	22	31·8	3·786	3·441	— ·607	6·620	— 0·020	
1111	October	12	F	20	37·3	6454·654	1·984	— ·608	6456·030	+ 0·570	
1116		12	F	21	27·6	5·110	2·365	— ·608	6·867	— 0·267	+ 0·410
1121		12	F	22	27·3	2·923	3·359	— ·608	6·674	+ 0·926	
1128	October	14	F	20	36·2	6455·075	1·961	— ·610	6456·426	+ 0·174	+ 0·034
1133		14	F	21	57·8	4·578	2·739	— ·610	6·707	— 0·107	
1140	October	16	F	21	4·6	6455·060	2·092	— ·611	6456·541	+ 0·059	+ 0·048
1143		16	F	22	15·4	4·188	2·985	— ·611	6·562	+ 0·038	
1157	October	18	F	20	49·2	6454·999	2·035	— ·613	6456·421	+ 0·179	
1164		18	F	21	57·1	4·498	2·728	— ·613	6·613	— 0·013	— 0·154
1169		18	F	22	47·4	3·937	3·903	— ·613	7·227	— 0·627	
1187	October	23	F	21	17·7	6455·020	2·238	— ·610	6456·648	— 0·048	
1192		23	F	22	17·9	3·844	3·096	— ·610	6·330	+ 0·270	— 0·060
1197		23	F	23	14·6	2·554	5·058	— ·610	7·002	— 0·402	
1217	October	30	G	21	43·7	6454·460	2·523	— ·601	6456·382	+ 0·218	
1221		30	G	22	22·2	3·987	3·194	— ·601	6·580	+ 0·020	+ 0·178
1228		30	G	23	26·6	1·107	5·797	— ·601	6·303	+ 0·297	
1260	November	8	F	22	43·2	6453·374	3·735	— ·574	6456·535	+ 0·065	+ 0·065
1262	November	10	G	22	53·7	6452·501	4·142	— ·566	6456·077	+ 0·523	+ 0·523
1265	November	11	G	22	58·5	6452·327	4·286	— ·562	6456·051	+ 0·549	+ 0·549
1268	November	14	F	23	1·8	6452·572	4·426	— ·548	6456·450	+ 0·150	+ 0·150

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TABLE II.—*continued.*

YALE OBSERVATIONS.

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	″	″	″	″	″	″
1	June	25	C	17 52·6	6453·681	2·58	+ ·228	6456·49	+ 0·11	+ 0·22
6		25	C	20 50·0	4·215	1·83	+ ·228	6·27	+ 0·33	
7	June	26	C	17 24·1	6452·982	3·13	+ ·216	6456·33	+ 0·27	+ 0·26
11		26	C	19 47·8	4·353	1·78	+ ·216	6·35	+ 0·25	
12	June	27	C	19 3·1	6455·038	1·94	+ ·203	6457·18	— 0·58	— 0·11
16		27	C	21 37·4	3·897	2·14	+ ·203	6·24	+ 0·36	
17	June	28	C	17 46·9	6453·718	2·68	+ ·190	6456·59	+ 0·01	+ 0·16
22		28	C	22 0·0	3·668	2·44	+ ·190	6·30	+ 0·30	
23	June	30	C	17 28·7	6453·770	3·04	+ ·178	6456·99	— 0·39	— 0·71
28		30	C	19 49·7	5·316	1·79	+ ·178	7·28	— 0·68	
32		30	C	21 55·5	5·114	2·36	+ ·178	7·65	— 1·05	
33	July	5	C	17 53·1	6453·606	2·63	+ ·127	6456·36	+ 0·24	+ 0·18
38		5	C	20 13·6	4·555	1·81	+ ·127	6·49	+ 0·11	
41	July	6	C	17 51·7	6453·972	2·64	+ ·114	6456·73	— 0·13	— 0·14
46		6	C	20 0·7	4·834	1·79	+ ·114	6·74	— 0·14	
49	July	8	C	17 35·0	6453·897	2·80	+ ·101	6456·80	— 0·20	— 0·15
54		8	C	19 19·6	4·797	1·80	+ ·101	6·70	— 0·10	
56	July	9	C	17 19·4	6453·236	3·30	+ ·089	6456·62	— 0·02	— 0·08
61		9	C	19 7·5	4·518	1·94	+ ·089	6·55	+ 0·05	
66		9	C	20 51·2	4·899	1·88	+ ·089	6·87	— 0·27	
67	July	11	C	17 45·6	6453·530	2·77	+ ·063	6456·36	+ 0·24	+ 0·31
72		11	C	19 32·4	4·291	1·87	+ ·063	6·22	+ 0·38	
75	July	13	C	18 0·9	6453·428	2·52	+ ·051	6456·00	+ 0·60	+ 0·10
80		13	C	20 3·9	5·152	1·80	+ ·051	7·00	— 0·40	
83	July	14	C	17 13·5	6453·161	3·42	+ ·038	6456·62	— 0·02	— 0·02
88	July	16	C	17 56·4	6454·163	2·56	+ ·013	6456·74	— 0·14	+ 0·10
93		16	C	19 58·6	4·454	1·80	+ ·013	6·27	+ 0·33	
97	July	17	C	17 30·3	6453·504	3·04	+ ·003	6456·55	+ 0·05	— 0·08
102		17	C	19 45·0	4·987	1·81	+ ·003	6·80	— 0·20	
105	July	18	C	17 38·1	6453·415	2·87	— ·013	6456·27	+ 0·33	+ 0·09
110		18	C	19 23·3	4·708	1·86	— ·013	6·56	+ 0·04	
115		18	C	21 13·8	4·721	1·98	— ·013	6·69	— 0·09	
116	July	19	C	17 25·3	6452·870	3·16	— ·013	6456·02	+ 0·58	+ 0·35
121		19	C	18 52·7	3·834	2·03	— ·013	5·85	+ 0·75	
126		19	C	20 21·1	5·088	1·81	— ·013	6·89	— 0·29	

The Yale observations were reduced and the Refraction and Aberration computed by Dr. Elkin in terms of the micrometer-screw. For uniformity in publication, columns 5, 6 and 7 were converted into seconds of arc in copying the work for press. There result small discrepancies which have not been altered.

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	″	″	″	″	″	″
127	July	20	C	17 30·4	6453·440	3·07	— ·025	6456·49	+ 0·11	
132		20	C	18 47·5	4·493	2·08	— ·025	6·55	+ 0·05	+ 0·01
137		20	C	20 31·9	4·924	1·84	— ·025	6·74	— 0·14	
138	July	21	C	17 21·5	6452·870	3·26	— ·038	6456·09	+ 0·51	+ 0·47
145		21	C	19 6·0	4·252	1·97	— ·038	6·18	+ 0·42	
146	July	22	C	17 28·1	6453·556	3·09	— ·051	6456·60	± 0·00	— 0·05
153		22	C	19 48·7	4·926	1·81	— ·051	6·69	— 0·09	
154	July	23	C	17 37·5	6454·644	2·92	— ·063	6457·50	— 0·90	
155	July	26	C	18 58·7	6454·758	1·94	— ·089	6456·61	— 0·01	
156	July	27	C	19 8·1	6454·758	1·90	— ·101	6456·56	+ 0·04	
157	July	30	C	17 54·9	6453·997	2·51	— ·127	6456·38	+ 0·22	
158	July	31	C	17 44·5	6453·897	2·68	— ·140	6456·44	+ 0·16	— 0·07
163		31	C	19 25·6	5·240	1·79	— ·140	6·89	— 0·29	
166	August	1	C	19 40·5	6455·379	1·79	— ·140	6457·03	— 0·43	
168	August	3	C	18 10·6	6455·279	2·35	— ·165	6457·46	— 0·86	— 0·46
172		3	C	20 46·8	4·975	1·84	— ·165	6·65	— 0·05	
173	August	4	C	18 26·7	6454·555	2·23	— ·177	6456·61	— 0·01	
178		4	C	19 32·8	4·316	1·80	— ·177	5·94	+ 0·66	+ 0·09
183		4	C	20 54·3	5·292	1·85	— ·177	6·97	— 0·37	
184	August	5	C	20 24·7	6454·797	1·81	— ·177	6456·43	+ 0·17	
185	August	6	C	17 31·4	6454·266	2·95	— ·190	6457·03	— 0·43	
190		6	C	19 2·7	4·797	1·91	— ·190	6·52	+ 0·08	— 0·09
195		6	C	20 40·8	5·025	1·81	— ·190	6·65	— 0·05	
200		6	C	22 15·8	4·073	2·68	— ·190	6·56	+ 0·04	
201	August	7	C	17 56·5	6454·924	2·53	— ·203	6457·25	— 0·65	— 0·16
206		7	C	19 36·1	4·669	1·80	— ·203	6·27	+ 0·33	
209	August	14	C	21 2·5	6454·393	1·90	— ·266	6456·03	+ 0·57	
210	August	15	C	18 6·4	6454·428	2·41	— ·279	6456·56	+ 0·04	
215		15	C	19 49·9	4·543	1·78	— ·279	6·04	+ 0·56	+ 0·09
220		15	C	21 10·2	5·240	1·96	— ·279	6·92	— 0·32	
221	August	16	C	18 54·3	6454·758	2·00	— ·292	6456·47	+ 0·13	+ 0·19
226		16	C	20 20·1	4·837	1·81	— ·292	6·36	+ 0·24	
230	August	18	C	19 4·8	6454·606	1·93	— ·304	6456·23	+ 0·37	+ 0·26
235		18	C	20 55·6	4·860	1·89	— ·304	6·45	+ 0·15	
238	August	23	C	18 5·1	6455·000	2·48	— ·355	6457·13	— 0·53	
243		23	C	19 16·9	4·936	1·92	— ·355	6·50	+ 0·10	— 0·08
248		23	C	20 32·8	4·924	1·84	— ·355	6·41	+ 0·19	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sider Tim		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
251	August	24	C	19	0·5	6454·810	1·99	— ·355	6456·45	+ 0·15	
256		24	C	20	17·9	4·784	1·81	— ·355	6·24	+ 0·36	+ 0·12
261		24	C	21	43·7	4·834	2·27	— ·355	6·75	— 0·15	
262	August	27	C	18	13·5	6454·784	2·30	— ·380	6456·70	— 0·10	
267		27	C	19	18·0	5·482	1·85	— ·380	6·95	— 0·35	— 0·15
272		27	C	20	31·1	5·190	1·78	— ·380	6·59	+ 0·01	
276	August	28	C	18	30·4	6454·645	2·17	— ·392	6456·42	+ 0·18	+ 0·17
281		28	C	19	29·2	5·013	1·83	— ·392	6·45	+ 0·15	
286	August	30	C	18	21·1	6454·568	2·25	— ·405	6456·41	+ 0·19	
291		30	C	19	23·4	4·822	1·85	— ·405	6·27	+ 0·33	+ 0·20
296		30	C	20	32·2	5·113	1·80	— ·405	6·51	+ 0·09	
298	August	31	C	18	39·8	6454·303	2·12	— ·418	6456·00	+ 0·60	
303		31	C	20	25·1	5·038	1·82	— ·418	6·44	+ 0·16	+ 0·32
308		31	C	21	27·0	4·721	2·11	— ·418	6·41	+ 0·19	
309	September	1	C	18	38·9	6454·910	2·14	— ·431	6456·62	— 0·02	
314		1	C	19	43·9	4·772	1·83	— ·431	6·17	+ 0·43	+ 0·13
319		1	C	20	50·9	5·178	1·87	— ·431	6·62	— 0·02	
323	September	2	C	20	39·3	6455·457	1·84	— ·431	6456·87	— 0·27	
324	September	3	C	19	56·6	6455·280	1·80	— ·443	6456·64	— 0·04	
329		3	C	21	3·7	4·818	1·91	— ·443	6·28	+ 0·32	+ 0·12
334		3	C	22	6·9	4·416	2·55	— ·443	6·52	+ 0·08	
335	September	4	C	19	13·4	6454·961	1·89	— ·443	6456·41	+ 0·19	
340		4	C	20	20·0	4·961	1·79	— ·443	6·31	+ 0·29	+ 0·32
345		4	C	21	37·9	4·391	2·18	— ·443	6·13	+ 0·47	
346	September	5	C	20	47·4	6454·240	1·84	— ·456	6455·62	+ 0·98	+ 0·57
351		5	C	22	13·5	4·266	2·64	— ·456	6·45	+ 0·15	
352	September	7	C	18	42·1	6454·734	2·08	— ·469	6456·35	+ 0·25	
356		7	C	20	2·4	4·987	1·79	— ·469	6·31	+ 0·29	— 0·04
361		7	C	21	19·6	5·710	2·02	— ·469	7·26	— 0·66	
363	September	8	C	19	0·2	6454·584	1·95	— ·469	6456·07	+ 0·53	+ 0·58
368		8	C	20	48·0	4·594	1·85	— ·469	5·98	+ 0·62	
371	September	18	C	19	20·2	6454·924	1·88	— ·532	6456·27	+ 0·33	
376		18	C	20	23·3	5·152	1·82	— ·532	6·44	+ 0·16	+ 0·30
381		18	C	21	23·5	4·657	2·05	— ·532	6·18	+ 0·42	
382	September	19	C	19	29·7	6454·873	1·83	— ·532	6456·17	+ 0·43	
387		19	C	20	26·6	4·899	1·79	— ·532	6·16	+ 0·44	+ 0·52
392		19	C	21	31·0	4·341	2·11	— ·532	5·92	+ 0·68	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	″	″	″	″	″	″
393	September	20	C	19	35·4	6454·797	1·84	— ·532	6456·11	+ 0·49	
398		20	C	20	30·2	4·949	1·84	— ·532	6·26	+ 0·34	+ 0·28
403		20	C	21	42·0	4·873	2·26	— ·532	6·60	± 0·00	
404	September	23	C	19	38·8	6455·228	1·80	— ·558	6456·47	+ 0·13	
407		23	C	20	18·6	5·279	1·78	— ·558	6·50	+ 0·10	+ 0·18
412		23	C	21	29·8	4·746	2·09	— ·558	6·28	+ 0·32	
413	September	24	C	19	47·6	6455·038	1·85	— ·558	6456·33	+ 0·27	
418		24	C	20	47·0	4·746	1·92	— ·558	6·11	+ 0·49	+ 0·44
423		24	C	21	55·5	4·113	2·47	— ·558	6·03	+ 0·57	
424	September	25	C	19	46·1	6454·495	1·85	— ·570	6455·78	+ 0·82	+ 0·30
427		25	C	20	26·2	5·558	1·84	— ·570	6·83	— 0·23	
436	October	5	C	20	42·1	6455·697	1·83	— ·608	6456·92	— 0·32	— 0·18
441		5	C	21	54·9	4·873	2·37	— ·608	6·64	— 0·04	
442	October	8	C	20	17·6	6455·254	1·83	— ·608	6456·47	+ 0·13	— 0·11
447		8	C	21	52·2	5·127	2·42	— ·608	6·94	— 0·34	

GÖTTINGEN OBSERVATIONS.

	1890.			h	m	″	″	″	″	″	″
1	May	19	S	16	56·0	6452·935	4·451	+ ·513	6457·899	— 1·299	— 0·982
8		19	S	18	39·5	4·569	2·182	+ ·513	7·264	— 0·664	
9	May	28	S	16	36·0	6451·152	5·610	+ ·457	6457·219	— 0·619	— 0·489
13		28	S	18	0·0	3·767	2·735	+ ·457	6·959	— 0·359	
14	June	1	S	16	44·5	6451·520	5·133	+ ·430	6457·083	— 0·483	— 0·418
19		1	S	18	26·0	4·133	2·389	+ ·430	6·952	— 0·352	
21	June	4	S	17	47·0	6453·251	2·926	+ ·407	6456·584	+ 0·016	
23	June	8	S	16	57·5	6451·787	4·509	+ ·375	6456·671	— 0·071	
28		8	S	18	19·0	4·273	2·488	+ ·375	7·136	— 0·536	— 0·216
33		8	S	19	42·0	4·389	1·877	+ ·375	6·641	— 0·041	
34	June	20	S	18	17·5	6453·993	2·443	+ ·272	6456·708	— 0·108	
37	June	25	S	17	44·0	6452·320	2·995	+ ·226	6455·541	+ 1·059	
42		25	S	19	3·5	3·083	2·000	+ ·226	5·309	+ 1·291	+ 1·103
47		25	S	20	22·5	3·644	1·772	+ ·226	5·642	+ 0·958	
48	June	27	S	19	50·0	6454·727	1·784	+ ·206	6456·717	— 0·117	— 0·127
51		27	S	20	41·0	4·752	1·778	+ ·206	6·736	— 0·136	
52	June	29	S	19	1·5	6454·957	2·011	+ ·187	6457·155	— 0·555	

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h m	′	″	″	′	″	″
54	July	10	S	17 23·5	6453·324	3·508	+ ·078	6456·910	— 0·310	
60		10	S	19 25·0	5·210	1·894	+ ·078	7·182	— 0·582	— 0·312
63		10	S	21 13·5	4·653	1·913	+ ·078	6·644	— 0·044	
64	July	12	S	18 5·0	6453·972	2·634	+ ·058	6456·664	— 0·064	— 0·371
71		12	S	19 58·0	5·416	1·804	+ ·058	7·278	— 0·678	
72	July	13	S	18 10·5	6454·916	2·535	+ ·048	6457·499	— 0·899	
76		13	S	19 31·0	5·030	1·860	+ ·048	6·938	— 0·338	— 0·698
80		13	S	21 44·5	5·257	2·151	+ ·048	7·456	— 0·856	
81	July	14	S	18 47·0	6454·581	2·093	+ ·038	6456·712	— 0·112	
86		14	S	20 18·5	4·916	1·748	+ ·038	6·702	— 0·102	— 0·114
90		14	S	21 30·0	4·700	1·990	+ ·038	6·728	— 0·128	
91	July	15	S	18 39·5	6454·306	2·134	+ ·028	6456·468	+ 0·132	
92	July	26	S	18 21·5	6454·254	2·374	— ·084	6456·544	+ 0·056	— 0·130
96		26	S	19 47·5	5·181	1·820	— ·084	6·917	— 0·317	
97	August	18	Hn	21 23·0	6455·994	1·900	— ·306	6457·588	— 0·988	
99	August	30	Hn	21 53·5	6455·726	2·260	— ·407	6457·579	— 0·979	— 1·011
103		30	Hn	23 6·5	3·824	4·226	— ·407	7·643	— 1·043	
104	September	8	S	20 29·5	6455·873	1·786	— ·471	6457·188	— 0·588	— 1·034
110		8	S	21 53·0	6·290	2·261	— ·471	8·080	— 1·480	
111	September	17	S	19 47·5	6456·346	1·786	— ·525	6457·607	— 1·007	— 0·787
119		17	S	22 9·5	5·236	2·456	— ·525	7·167	— 0·567	
120	September	18	S	19 42·0	6456·087	1·801	— ·531	6457·357	— 0·757	
125		18	S	20 50·5	6·394	1·795	— ·531	7·658	— 1·058	— 0·889
130		18	S	21 52·0	5·778	2·204	— ·531	7·451	— 0·851	
131	October	3	S	21 8·0	6455·344	1·890	— ·589	6456·645	— 0·045	— 0·154
134		3	S	22 7·5	5·001	2·451	— ·589	6·863	— 0·263	
135	October	8	S	20 29·0	6455·152	1·815	— ·602	6456·365	+ 0·235	— 0·052
140		8	S	22 14·5	4·904	2·636	— ·602	6·938	— 0·338	
141	October	9	S	20 19·5	6455·658	1·817	— ·605	6456·870	— 0·270	+ 0·020
146		9	S	21 34·5	4·784	2·110	— ·605	6·289	+ 0·311	
147	October	11	S	20 44·0	6455·528	1·820	— ·607	6456·741	— 0·141	+ 0·028
153		11	S	22 15·5	4·397	2·613	— ·607	6·403	+ 0·197	
154	October	13	S	20 32·0	6455·609	1·801	— ·608	6456·802	— 0·202	+ 0·052
161		13	S	22 8·0	4·415	2·488	— ·608	6·295	+ 0·305	
162	October	14	S	20 17·0	6455·718	1·776	— ·609	6456·885	— 0·285	
167		14	S	21 36·0	5·464	2·078	— ·609	6·933	— 0·333	— 0·263
171		14	S	22 46·0	4·016	3·364	— ·609	6·771	— 0·171	

Nos. 97, 99, and 103. Observed by Dr. Hayn—his observations, not being sufficiently numerous for complete discussion, are not further utilized.

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TABLE II.—*continued.*

Rotation No. of Obs.	Date.		Observer.	Sidereal Time.		Observed Distance.	Refraction.	Aberration.	Mean Distance.	$\Sigma_0 - \Sigma$ Separate Results.	$\Sigma_0 - \Sigma$ Mean.
	1890.			h	m	′	′	′	′	′	′
172	November	13	S	21	34·5	6455·068	2·127	— ·553	6456·642	— 0·042	
175	November	16	S	21	15·5	6455·057	1·994	— ·537	6456·514	+ 0·086	+ 0·015
182		16	S	22	33·0	4·116	3·078	— ·537	6·657	— 0·057	
183	May	22	An	17	1·0	6452·196	4·281	+ ·497	6456·974	— 0·374	+ 0·060
190		22	An	18	38·0	3·384	2·225	+ ·497	6·106	+ 0·494	
192	May	23	An	16	43·0	6451·368	5·168	+ ·490	6457·026	— 0·426	
196		23	An	17	31·0	3·531	3·317	+ ·490	7·338	— 0·738	— 0·306
202		23	An	18	39·0	3·643	2·221	+ ·490	6·354	+ 0·246	
203	May	24	An	16	45·0	6451·087	5·033	+ ·484	6456·604	— 0·004	+ 0·316
211		24	An	18	37·5	3·256	2·224	+ ·484	5·964	+ 0·636	
212	August	9	An	19	16·0	6454·193	1·901	— ·222	6455·872	+ 0·728	
217	August	17	An	19	38·5	6455·088	1·784	— ·296	6456·576	+ 0·024	
220	August	18	An	19	2·0	6455·084	1·943	— ·306	6456·721	— 0·121	
225		18	An	19	53·0	5·276	1·740	— ·306	6·710	— 0·110	— 0·198
231		18	An	20	58·5	5·488	1·781	— ·306	6·963	— 0·363	
232	August	21	An	18	48·5	6454·745	2·093	— ·332	6456·506	+ 0·094	— 0·170
239		21	An	20	23·5	5·609	1·756	— ·332	7·033	— 0·433	
241	August	22	An	19	35·3	6455·124	1·847	— ·341	6456·630	— 0·030	
247		22	An	21	11·0	5·658	1·899	— ·341	7·216	— 0·616	— 0·315
253		22	An	22	34·5	4·220	3·020	— ·341	6·899	— 0·299	
254	August	30	An	18	51·8	6454·897	2·089	— ·407	6456·579	+ 0·021	
261		30	An	20	20·5	4·937	1·776	— ·407	6·306	+ 0·294	+ 0·270
268		30	An	21	37·0	4·433	2·078	— ·407	6·104	+ 0·496	
269	September	1	An	21	50·5	6454·639	2·244	— ·420	6456·463	+ 0·137	— 0·014
277		1	An	23	15·5	2·368	4·817	— ·420	6·765	— 0·165	
279	September	2	An	19	9·0	6455·001	2·004	— ·428	6456·577	+ 0·023	+ 0·076
284		2	An	20	25·5	5·093	1·807	— ·428	6·472	+ 0·128	
285	September	3	An	21	56·5	6454·469	2·321	— ·435	6456·355	+ 0·245	
289	September	10	An	19	15·3	6455·193	1·925	— ·484	6456·634	— 0·034	
296		10	An	20	35·5	5·321	1·775	— ·484	6·612	— 0·012	+ 0·008
301		10	An	22	9·5	4·549	2·465	— ·484	6·530	+ 0·070	
304	September	13	An	19	38·0	6455·372	1·859	— ·501	6456·730	— 0·130	
310		13	An	21	13·0	4·864	1·935	— ·501	6·298	+ 0·302	+ 0·023
316		13	An	23	20·0	2·095	5·109	— ·501	6·703	— 0·103	
317	November	10	An	21	32·0	6455·152	2·071	— ·566	6456·657	— 0·057	+ 0·185
321		10	An	22	34·5	3·675	3·064	— ·566	6·173	+ 0·427	

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CHAPTER III.

Observations of the Distances in the Triangulation.

The results of the observations of distance in the triangulation are given in the following Table III.

The first seven columns are sufficiently described by their headings, it being understood that "Observed Distances" are reduced to seconds of arc with the same scale-values as the corresponding observations of the Standard stars (Table II.).

The columns marked "Correction for Scale-value" give the preliminary correction $= \frac{\sigma}{\Sigma_0} (\Sigma_0 - \Sigma)$.

The value of $\frac{\sigma}{\Sigma_0}$ is given for each pair of stars at the head of the columns.

Under Sub-head I. the corresponding value of $(\Sigma_0 - \Sigma)$ is taken from column 10 of Table II.

Under Sub-head II. the value of $(\Sigma_0 - \Sigma)$ is found by interpolation, with the argument "Sidereal time," from the corresponding results of Table II., column 9, in the manner described in Chapter I., Section 9.

The columns "Resulting Distance" give simply the "observed distance" corrected for refraction, aberration and scale-value; under Sub-head I. this last correction is computed according to method I, and under Sub-head II. according to method II. (*see* Chapter I., Section 9).

In cases where there has been only one observation of the standard distance, the distance derived by method I. has been used also for II., in order to preserve the symmetry in taking means, the value being printed in brackets, thus [0·61].

None of the resulting distances are, at this stage, corrected for proper motion, but, for convenience, the annual proper motion in distance (μ_s) based on the Auwers data (Chapter V., Table V.) is given at the head of the columns for each pair of stars.

The quality of the definition is denoted in the last column under two heads. I denoting the quality of the Images, S their Steadiness, according to the following scale: —

1 Images perfect (rings sharp and steady).	1. Absolutely steady.
2. ,, good (rings disturbed).	2. Fairly steady.
3. ,, poor (rings lost in disc) image rather diffuse.	3. Very unsteady.
4. ,, barely observable, disc an agitated nebulous mass.	4. So unsteady as to be all but unobservable.

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Intermediate qualities are denoted 2–3 : 3–4, &c. When the figures are included in brackets, thus (2–3 : 3) the definition is inferred from collateral evidence, and has not been distinctly noted by the observer.

From previous discussions it was found that when the Images are 3 or the Steadiness 3–4, half weight should be given to Gill and Finlay's observations, and ¼ weight when the Images are 3–4 or the Steadiness 4. These cases are indicated by (½) or (¼) printed opposite to the result—and the means are taken having regard to these weights.

TABLE III.

Triangulation of Victoria Comparison Stars. Results of Heliometer Observations of Distance.

Pair 1. f (7·6)* and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}001$; $\mu_s = +\,''{\cdot}009$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	284	June 5	15 52·2	6461·301	2·925	+·382	− ·104	− ·120	4·50	4·49	2 : 2
	617	July 25	16 2·9	1·875	2·748	−·098	+ ·145	+ ·260	(½) 4·67	(½) 4·79	3 · 3
	875	Aug. 26	21 15·3	2·574	2·585	−·395	− ·105	− ·090	(½) 4·66	(½) 4·67	3 : 3–4
									6464·58	4·61	
F	84	Apr. 12	15 37·8	6461·256	3·290	+·614	+ ·044	− ·060	5·20	5·10	2 : 2–3
	944	Sept. 1	21 46·0	2·704	3·095	−·440	− ·110	− ·110	5·25	5·25	2 : 2–3
									6465·23	5·18	
J	586	July 22	21 55·4	6461·362	3·342	−·068	+1·253	+1·510	6465·89†	6·15	1–2 : 2
C	57	July 9	17 39·8	6461·137	3·640	+·063	− ·080	+ ·050	4·76	4·89	
	259	Aug. 24	21 6·4	3·218	1·826	−·380	+ ·120	+ ·150	4·78	4·81	
	379	Sept. 18	20 56·4	3·609	1·800	−·545	+ ·300	+ ·300	5·17	5·17	
									6464·90	4·96	
S	2	May 19	17 14·5	6459·906	5·577	+·503	− ·983	−1·131	6465·00	4·86	

* The magnitudes of the stars given in this Table are those of Schönfeld in the D.M. They were employed in the original discussions of probable error, because no other magnitudes were then available. But in all the final and definitive discussion, beginning with the systematic error of Meridian Right Ascensions depending on magnitude, the definitive magnitudes are employed—that is to say, Schönfeld's magnitudes were adopted as far as Chap. IV. of the present work—but afterwards the magnitudes of Chap. V.

† A few errors in the "Correction for Scale-value" were found after solution of the Equations. The correct value is printed and the "Distance" used in subsequent sections is given in the notes. In this case 6466″·11 was used.

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TABLE III.—*continued.*

Pair 2. f (7·6) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}528$; $\mu_s = +\ 0''{\cdot}034$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	′	′	
G	231	May 22	17 48·4	3405·875	1·216	+·250	—·130	—·198	7·21	7·14	(2–3 : 2–3)
	1102	Oct. 11	21 5·1	6·259	1·040	—·322	+·043	+·074	(½) 7·02	(½) 7·05	3 : 2–3
									3407·15	7·11	
F	85	Apr. 12	15 54·6	3404·340	2·703	+·323	+·023	+·011	3407·39	7·38	2 : 2–3
C	19	June 28	19 23·2	3405·536	0·964	+·089	+·084	+·084	3406·67	6·67	

Pair 3. p (7·7) and s (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}985$; $\mu_s - 0''{\cdot}001$.

		1890									
G	282	June 5	15 25·7	6354·449	2·931	+·393	—·102	—·074	7·67	7·70	2 : 3
	668	Aug. 6	16 5·0	5·631	2·252	—·193	+·112	+·010	7·80	7·70	(2–3 : 2–3)
									6357·74	7·70	
F	86	Apr. 12	16 12·9	6354·982	2·193	+·603	+·043	+·108	7·82	7·89	2 : 2–3
	945	Sept. 1	21 55·2	5·930	3·232	—·417	·108	—·098	8·64	8·65	2 : 2–3
									6358·23	8·27	
C	117	July 19	17 41·6	6353·513	4·159	—·013	+·345	+·699	8·01	8·36	
	282	Aug. 28	19 41·9	5·871	2·282	—·393	+·167	+·167	7·93	7·93	
									6357·97	8·15	
S	132	Oct. 3	21 25·5	6356·454	2·089	—·583	—·152	—·108	7·81	7·85	
An	191	May 22	18 49·0	6354·191	3·688	+ 489	+·059	+·414	8·43	8·78	
									6358·12	8·32	

Pair 4. p (7·7) and l (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}784$; $\mu_s = -\ 0''{\cdot}019$.

		1890									
G	669	Aug. 6	16 17·0	5059·560	1·589	—·163	+·089	+·031	5061·08	1·02	(2–3 : 2–3)
F	87	Apr. 12	16 26·3	5058·882	1·561	+·478	+·034	+·125	5060·96	1·05	2 : 2–3
C	98	July 17	17 45·5	5058·476	3·068	—·013	—·078	—·009	5061·45	61·53	
An	199	May 23	18 11·0	5057·478	3·595	+·376	—·240	—·196	5061·21	1·25	

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TABLE III.—*continued.*

Pair 5. q (8·3) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}685$; $\mu_s = -0''{\cdot}027$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	′	′	′	′	′	′	
G	428	July 10	16 39·2	4421·162	1·565	+·049	+·104	+·110	(½) 2·88	(½) 2·89	3 : 2–3
	470	July 13	17 20·2	1·248	1·370	+·029	+·058	+·017	2·71	2·66	2 : 2
									4422·77	2·74	
F	89	Apr. 12	16 55·4	4420·917	1·470	+·419	+·030	+·206	2·84	3·01	2 : 2–3
	1130	Oct. 14	21 4·3	1·924	1·659	—·418	+·023	+·051	(½) 3·19	(½) 3·22	3–4 : 3–4
									4422·91	3·05	
C	111	July 18	19 52·6	4421·419	1·382	—·013	+·062	+·021	2·85	2·81	
	277	Aug. 28	18 44·0	1·318	1·750	—·279	+·116	+·116	2·91	2·91	
									4422·88	2·86	
S	12	May 28	17 44·5	4419·472	3·088	+·311	—·335	—·308	2·54	2·56	
	136	Oct. 8	20 40·5	22·298	1·386	—·413	—·036	+·075	3·24	3·35	
									4422·89	2·96	

Pair 6. q (8·3) and t (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}511$; $\mu_s = +0''{\cdot}005$.

		1890									
G	294	June 8	15 47·8	3297·910	2·939	+·195	—·003	+·050	(½) 1·04	(½) 1·09	3–4 : 3–4
	471	July 13	17 35·0	299·863	1·263	+·027	+·043	—·005	1·20	1·15	2 : 2
	863	Aug. 25	21 22·4	300·150	1·104	—·186	—·053	—·038	1·02	1·03	2 : 2–3
									3301·10*	1·09†	
F	90	Apr. 12	17 14·8	3299·360	1·399	+·313	+·022	+·194	1·09	1·27	2 : 2–3
	917	Aug. 29	22 4·7	300·126	1·354	—·203	—·056	—·301	1·22	0·98	2 : 3 faint
	1131	Oct. 14	21 20·8	300·175	1·082	—·313	+·017	+·005	(½) 0·96	(½) 0·95	3–4 : 3–4
									3301·13	1·11	
C	120	July 19	18 36·8	3299·699	1·002	·000	+·179	+·388	0·88	1·09	
	289	Aug. 30	18 59·0	300·093	0·939	—·203	+·102	+·148	0·93	0·98	
	395	Sept. 20	19 57·3	300·575	0·926	—·279	+·143	+·230	1·36	1·45	
									3301·06	1·17	
S	10	May 28	16 56·0	3298·799	1·773	+·236	—·250	—·256	0·56	0·55	
	129	Sept. 18	21 40·5	300·667	1·317	—·271	—·454	—·491	1·26	1·22	
									3300·91	0·89	

* 3301″·11 used. † 1″·10 used.

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TABLE III.—*continued.*

Pair 7. e (8·2) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}244$; $\mu_s = +\ 0''{\cdot}032$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	297	June 8	16 29·7	1576·592	0·524	+·084	+·031	·000	(¼) 7·23	(¼) 7·20	3 : 3–4
	684	Aug. 8	17 18·7	6·936	0·470	—·061	+·064	+·039	7·41	7·38	1 : 2–3
	793	,, 17	21 30·7	6·861	0·728	—·081	—·009	·000	7·50	7·51	2 : 2–3
									1577·43	7·42	
F	94	Apr. 15	16 11·1	1576·580	0·558	+·150	—·001	—·056	1577·29	7·23	
C	34	July 5	18 30·6	1576·464	0·710	+·025	+·044	+·044	7·24	7·24	
	242	Aug. 23	19 5·7	6·807	0·583	—·089	—·020	—·007	7·28	7·29	
									1577·26	7·27	
S	24	June 8	17 16·0	1576·164	1·404	+·084	—·053	—·066	7·60	7·59	
	142	Oct. 9	20 33·0	6·816	0·522	—·149	+·005	—·024	7·18	7·17	
									1577·39	7·38	

Pair 8. e (8·2) and E (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}830$; $\mu_s = +\ 0''{\cdot}010$.

G	296	1890 June 8	16 18·6	5325·274	1·671	+·291	+·005	—·025	(½) 7·24	(½) 7·21	3 : 3
	469	July 13	17 8·4	5·279	1·552	+·012	+·071	+·042	6·91	6·89	2 : 2
	685	Aug. 8	17 25·5	5·593	1·536	—·204	+·217	+·191	7·14	7·12	1 : 2–3
	792	,, 17	21 23·0	5·036	2·402	—·272	—·030	—·008	7·14	7·16	2 : 2–3
									5327·09*	7·08†	
F	95	Apr. 15	16 26·3	5324·634	1·609	+·510	—·004	—·224	6·75	6·53	(2–3 : 2–3)
	913	Aug. 29	21 15·9	5·802	2·353	—·353	—·398	—·249	7·40	7·55	2 : 3 faint
									5327·08	7·04	
C	40	July 5	20 53·6	5325·277	1·636	+·076	+·149	+·149	7·14	7·14	
	252	Aug. 24	19 13·9	5·354	2·194	—·317	+·100	+·216	7·33	7·45	
	375	Sept. 18	20 14·0	5·621	1·788	— 443	+·249	+·249	7·22	7·22	
									5327·23	7·27	
An	271	Sept. 1	22 13·5	5326·012	1·681	—·371	—·011	+·033	5327·31	7·36	

* 5327″·10 used. † 7″·09 used.

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TABLE III.—*continued.*

Pair 9. *d* (8·4) and *a* (7·7) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}538$; $\mu_s = +\ 0''{\cdot}004$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	310	June 11	15 31·6	3474·129	3·048	+ ·169	+ ·005	— ·040	7·35	7·31	2-3 : 3
	892	Aug. 28	21 11·2	6·676	1·176	— ·230	— ·135	— ·108	7·49	7·51	2 : 2
									3477·42	7·41	
F	96	Apr. 15	16 44·6	3475·417	1·565	+ ·330	— ·003	— ·161	7·31	7·15	(2-3 : 2-3)
	149	„ 30	15 36·5	4·643	2·847	+ ·313	— ·156	— ·237	7·65	7·57	2-3 : 3
									3477·48	7·36	
C	4	June 25	19 52·3	3476·487	0·951	+ ·101	+ ·119	+ ·119	7·66	7·66	
	237	Aug. 18	21 33·4	6·753	1·560	— ·190	+ ·140	+ ·140	8·26	8·26	
	239	„ 23	18 20·9	6·741	1·039	— ·216	— ·043	— ·179	7·53	7·39	
	426	Sept. 25	20 15·6	6·093	1·077	— ·317	+ ·108	+ ·049	6·97	6·91	
									3477·61	7·56	
S	39	June 25	18 19·5	3475·668	1·005	+ ·099	+ ·594	+ ·646	7·37	7·42	
	148	Oct. 11	20 59·5	6·637	1·325	— ·331	+ ·015	— ·005	7·65	7·63	
									3477·51	7·53	

Pair 10. *d* (8·4) and E (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}749$; $\mu_s = +\ 0''{\cdot}004$.

		1890									
G	313	June 11	16 2·1	4786·197	2·443	— ·243	+ ·007	+ ·037	8·40	8·43	2-3 : 3
	893	Aug. 28	21 20·3	7·448	1·899	— ·314	— ·187	— ·202	8·85	8·83	2 : 2
	1058	Oct. 7	21 31·8	7·391	2·024	— ·457	— ·116	+ ·037	8·84	9·00	1-2 : 2
									4788·70	8·75	
F	150	Apr. 30	15 47·7	4785·768	2·734	+ ·440	— ·216	— ·292	8·73	8·65	2-3 : 3
	914	Aug. 29	21 26·2	7·630	1·964	— ·319	— ·360	— ·270	8·92	9·01	2 : 3 faint.
									4788·83	8·83	
J	585	July 22	21 48·1	4785·759	2·236	— ·059	+0·936	+1·180	4788·87*	9·12	1-2 : 1-2
C	30	June 30	20 55·6	4787·181	1·344	+ ·101	— ·532	— ·644	8·10	7·99	
	247	Aug. 23	20 15·2	7·891	1·357	— ·279	— ·060	+ ·135	8·91	9·11	
	372	Sept. 18	19 32·5	7·435	1·395	— ·405	+ ·225	+ ·225	8·66	8·66	
									4788·56	8·59	
An	273	Sept. 1	22 35	4786·831	2·062	— ·336	— ·011	·000	4788·55	8·56	

* 4789″·04 used.

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TABLE III.—*continued.*

Pair 11. t (7·8) and r (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}550$; $\mu_s = +\ 0''{\cdot}008$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	226	May 22	16 51·9	3548·495	1·034	+ ·275	− ·136	− ·115	9·67	9·69	(2–3 : 2–3)
	618	July 25	16 15·8	8·350	1·043	− ·036	+ ·080	+ ·096	(½) 9·44	(½) 9·45	3 : 3
									3549·59	9·61	
F	97	Apr. 15	17 13·8	3548·445	1·029	+ ·336	− ·003	− ·176	49·81	49·63	(2–3 : 2–3)
	154	„ 30	16 36·8	8·515	1·020	+ ·326	− ·159	− ·115	49·70	49·75	2–3 : 3
	769	Aug. 16	17 37·5	8·687	1·078	− ·154	− ·037	− ·005	49·57	49·61	2 : 3
	827	„ 20	17 48·5	9·086	1·070	− ·174	+ ·069	+ ·115	(½) 50·05	(½) 50·10	3 : 3
									3549·74	9·73	
C	125	July 19	20 6·8	3547·920	1·649	·000	+ ·193	− ·006	9·76	9·56	
	284	Aug. 28	20 13·1	8·173	1·598	− ·216	+ ·094	+ ·094	9·65	9·65	
	397	Sept. 20	20 22·5	8·198	1·611	− ·292	+ ·154	+ ·193	9·67	9·71	
									3549·69	9·64	
S	45	June 25	19 57·5	3546·646	1·662	+ ·128	+ ·607	+ ·621	49·04	49·06	
	156	Oct. 13	21 1	8·152	2·236	− ·334	+ ·029	− ·005	50·08	50·05	
									3549·56	9·56	

Pair 12. t (7·8) and F (8·3) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}042$; $\mu_s = -\ 0''{\cdot}007$.

		1890									
G	227	May 22	17 1·3	6719·447	1·902	+ ·530	− ·257	− ·271	1·62	1·61	(2–3 : 2–3)
	754	Aug. 15	17 34·9	9·488	1·949	− ·280	+ ·057	+ ·078	1·21	1·24	2–3 : 3
									6721·42	1·43	
F	155	Apr. 30	16 49·7	6718·999	1·886	+ ·626	− ·301	− ·177	1·21	1·33	2–3 : 3
	770	Aug. 16	17 48·9	9·569	1·986	− ·290	− ·070	+ ·078	1·20	1·34	2 : 3
									6721·21	1·34	
C	142	July 21	18 19·9	6717·169	4·502	− ·025	+ ·489	+ ·490	2·14	2·14	
	307	Aug. 31	21 16·1	9·185	2·726	− ·418	+ ·333	+ ·157	1·83	1·66	
									6721·99	1·90	
An	286	Sept. 3	22 15·5	6717·489	3·999	− ·448	+ ·256	+ ·261	6721·30	1·30	

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TABLE III.—*continued.*

Pair 13. θ (8·5) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}128$; $\mu_s = +\ 0''{\cdot}074$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	365	June 16	17 19·3	7277·880	2·537	+ ·399	+ ·119	+ ·028	0·94	0·84	2–3 : 3
	690	Aug. 8	21 4·0	8·428	2·855	— ·190	— ·460	— ·198	0·63	0·90	1–2 : 2–3
									7280·79	0·87	
F	99	Apr. 15	18 5·1	7277·448	2·433	+ ·697	— ·006	— ·073	0·57	0·51	
	1052	Oct. 6	21 45·9	8·871	3·088	— ·669	+ ·198	+ ·113	(½) 1·49	(½) 1·40	3 : 2–3
									7280·88	0·81	
S	53	June 29	19 21	7274·048	6·932	+ ·266	— ·632	...	0·61	[0·61]	
	160	Oct. 13	21 55·5	4·225	7·147	— ·689	+ ·058	+ ·180	0·74	0·86	
									7280·68	0·74	

Pair 14. θ (8·5) and κ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}922$; $\mu_s = -\ 0''{\cdot}017$.

		1890									
G	520	July 17	22 32·1	5947·159	2·850	+ ·053	+ ·023	+ ·018	0·09	0·08	1–2 : 2–3
	889	Aug. 28	18 25·2	8·857	1·997	— ·330	— ·089	— ·129	0·43	0·40	2–3 : 2–3
									5950·26	0·24	
F	100	Apr. 15	18 15·8	5947·312	1·931	+ ·573	— ·003	+ ·041	49·81	49·86	(2 : 2)
	1195	Oct. 23	22 53·8	8·391	2·942	— ·575	— ·055	— ·046	(½) 50·70	(½) 50·71	3 : 3–4
									5950·11	0·14	
S	49	June 27	20 16	5945·100	5·773	+ ·237	— ·177	— ·120	0·99	0·99	
	158	Oct. 13	21 30·5	5·273	6·129	— ·566	+ ·048	+ ·074	0·88	0·91	
									5950·94	0·95	

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TABLE III.—*continued.*

Pair 15. λ (7·3) and θ (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}527$; $\mu_s = -0''{\cdot}011$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	413	July 8	22 56·3	3401·989	2·134	+ ·081	+ ·054	...	4·26	[4·26]	2 : 2-3
	676	Aug. 6	17 22·3	3·320	1·073	— ·076	+ ·060	+ ·119	4·38	4·44	(2-3 : 2-3)
									3404·32	4·35	
F	178	May 3	16 59·6	3402·654	1·137	+ ·320	— ·138	— ·121	3·97	3·99	2 : 2-3
	1077	Oct. 8	22 11·2	2·749	1·577	— ·316	— ·057	— ·290	(½) 3·95	(½) 3·72	2-3 : 3-4
									3403·96	3·85	
S	50	June 27	20 29	3402·521	1·306	+ ·138	— ·067	— ·074	3·90	3·89	
	159	Oct. 13	21 42·5	3·545	1·064	— ·322	+ ·027	+ ·063	4·31	4·35	
									3404·11	4·12	

Pair 16. λ (7·3) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}687$; $\mu_s = -0''{\cdot}014$.

G	50	1889 Sept. 8	18 32·9	4432·038	1·744	— ·306	+ ·350	+ ·364	3·83	3·84	2 : 2-3
	427	1890 July 10	16 26·1	0·252	3·092	+ ·092	+ ·104	+ ·131	(½) 3·56	(½) 3·57	3 : 2-3
	671	Aug. 6	16 37·3	1·039	2·834	— ·099	+ ·078	+ ·062	3·85	3·84	(2-3 : 2-3)
	1091	Oct. 9	22 48·1	2·991	1·405	— ·415	+ ·027	— ·096	4·01	3·89	2-3 : 2-3
	1219	„ 30	22 3·3	2·783	1·384	— ·426	+ ·122	+ ·062	(½) 3·86	(½) 3·80	3 : 3
									4433·85	3·81	
F	179	May 3	17 11·0	4431·261	2·282	+ ·419	— ·180	— ·172	(½) 3·78	(½) 3·79	3 : 3
	1045	Oct. 4	21 57·4	3·022	1·401	— ·405	— ·004	+ ·034	4·01	4·05	2 : 3
	1097	„ 10	21 5·2	2·748	1·409	— ·417	+ ·274	+ ·172	4·01	3·91	2-3 : 3
	1199	„ 23	23 37·1	3·374	1·421	— ·429	— ·041	— ·378	(½) 4·33	(½) 3·99	3 : 3-4
									4434·03	3·95	
C	234	Aug. 18	20 37·8	4431·590	2·891	— ·190	+ ·179	+ ·179	4·47	4·47	
	357	Sept. 7	20 21·5	1·360	2·777	— ·292	— ·027	+ ·034	3·88	3·88	
									4434·18	4·18	
S	67	July 12	18 48	4430·149	4·119	+ ·078	— ·255	— ·213	4434·09	4·13	
	170	Oct. 14	22 30·5	27·707	8·179	— ·423	— ·181	— ·185	(5·28)	(5·28)	Rejected.

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TABLE III.—*continued.*

Pair 17. m (5·0) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}240$; $\mu_s = +\ 0''{\cdot}046$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	′	′	′	′	′	′	
G	405	July 4	16 7·2	1548·767	0·436	+ ·028	+ ·053	+ ·078	9·28	9·31	2 : 2 faint.
	681	Aug. 8	16 32·3	8·879	0·445	— ·057	+ ·063	+ ·030	9·33	9·30	2 : 2–3
									1549·31	9·31	
F	151	Apr. 30	16 1·4	1549·078	0·429	+ ·141	— ·069	— ·082	9·58	9·57	2–3 : 3
	767	Aug. 16	17 13·6	9·125	0·453	— ·074	— ·016	— ·038	9·49	9·47	2 : 3
									1549·54	9·52	
C	90	July 16	18 50·5	1548·528	0·799	·000	+ ·024	+ ·017	9·35	9·35	
	264	Aug. 27	18 47·8	8·502	0·824	— ·076	— ·034	— ·067	9·22	9·18	
									1549·29	9·27	
S	73	July 13	18 25	1548·319	1·320	+ ·006	— ·167	— ·173	9·48	9·47	
	174	Nov. 13	22 4	8·259	0·909	— ·131	— ·010	— ·009	9·03	9·03	
									1549·26	9·25	

Pair 18. m (5·0) and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}572$; $\mu_s - 0''{\cdot}095$.

		1890									
G	406	July 4	16 17·1	3695·765	1·036	+·069	+·128	+·160	7·00	7·03	2 : 2 faint.
	682	Aug. 8	16 58·5	5·436	1·062	—·132	+·150	+·069	6·52	6·44	2 : 2–3
									3696·76	6·74	
F	152	Apr. 30	16 13·1	3695·344	1·022	+·337	—·165	—·157	6·54	6·55	2–3 : 3
	768	Aug. 16	17 27·8	5·624	1·072	—·175	—·038	—·040	6·48	6·48	2 : 3
									3696·51	6·52	
C	99	July 17	18 20·8	3693·816	2·207	—·013	—·057	—·040	5·95	5·97	
	266	Aug. 27	19 17·3	5·223	1·775	—·228	—·086	—·172	6·68	6·60	
									3696·32	6·29	
S	68	July 12	19 11	3694·779	2·667	+· 13	—·212	—·235	7·25	7·22	
	173	Nov. 13	21 48·5	4·903	2·054	—·312	—·024	—·023	6·62	6·62	
									3696·94	6·92	

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TABLE III.—*continued.*

Pair 19. z (8·5) and x (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}518$; $\mu_s = +\ 0''{\cdot}047$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	414	July 8	23 10·2	3343·061	2·333	+ ·065	+ ·053	...	(½) 5·51	(½) [5·51]	3–4 : 3–4
	675	Aug. 6	17 12·5	4·621	1·320	— ·088	+ ·059	+ ·098	5·91	5·95	(2-3 : 2-3)
									3345·83	5·86	
F	157	Apr. 30	17 12·3	3344·092	1·307	+ ·313	— ·150	— ·047	5·56	5·67	2–3 : 3
	1118	Oct. 12	21 49·4	4·558	1·309	— ·316	+ ·212	— ·021	5·76	5·53	2 : 3
									3345·66	5·60	
C	181	Aug. 4	20 23·2	3344·755	0·913	— ·076	+ ·047	+ ·078	5·64	5·67	
	333	Sept. 3	21 57·0	4·540	1·128	— ·216	+ ·062	+ ·104	5·51	5·55	
									3345·58	5·61	
S	95	July 26	19 31·5	3343·946	1·028	— ·030	— ·067	— ·104	4·88	4·84	
	179	Nov. 16	22 0·5	4·685	1·139	— ·288	+ ·008	— ·005	5·54	5·53	
									3345·21	5·19	

Pair 20. z (8·5) and ε (6·3) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}597$; $\mu_s = +\ 0''{\cdot}012$.

G	425	1890 July 10	15 57·1	3850·197	4·051	+ ·070	+ ·091	+ ·134	(½) 4·41	(½) 4·45	3 : 2–3
	736	Aug. 13	21 53·3	3·420	1·298	— ·136	— ·186	— ·275	4·40	4·31	1–2 : 2
									3854·40	4·36	
F	180	May 3	17 25·6	3852·496	1·769	+ ·358	— ·156	— ·161	(½) 4·47	(½) 4·46	3 : 3
	1191	Oct. 23	22 8·6	3·590	1·323	— ·369	— ·036	+ ·101	4·51	4·65	2–3 : 3
									3854·50	4·59	
C	204	Aug. 7	19 1·7	3853·927	1·052	— ·114	— ·096	— ·018	4·77	4·85	
	339	Sept. 4	20 6·7	3·471	1·128	— ·254	+ ·191	+ ·161	4·16	4·51	
									3854·47	4·68	
S	82	July 14	19 7	3853·226	1·040	+ ·046	— ·068	— ·072	4·24	4·24	
	177	Nov. 16	21 36	3·170	1·871	— ·334	+ ·009	·000	4·72	4·71	
									3854·48	4·48	

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TABLE III.—*continued.*

Pair 21. x (8·0) and s (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}905$; $\mu_s = +\ 0''{\cdot}064$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	301	June 8	17 22·8	5840·611	2·512	+ ·352	− ·005	−·127	(½) 3·47	(½) 3·35	3 : 3
	670	Aug. 6	16 25·5	39·760	3·861	− ·164	+ ·103	+·045	3·56	3·50	(2–3 : 2–3)
									5843·53*	3·45	
F	156	Apr. 30	17 1·4	5840·799	2·862	+ ·542	− ·262	− ·118	3·94	4·08	2–3 : 3
	825	Aug. 20	17 26·3	1·362	2·454	− ·284	+ ·114	+ ·054	(½) 3·65	(½) 3·59	3 : 3
									5843·84	3·92	
C	139	July 21	17 35·6	5841·665	2·156	− ·025	+ ·425	+ ·425	4·23	4·23	
	304	Aug. 31	20 37·4	1·969	1·851	− ·368	+ ·290	+ ·181	3·75	3·64	
									5843·99	3·94	
An	224	Aug. 18	19 41	5842·615	1·585	−·267	−·179	−·109	5843·75	3·82	

* 5843″·57 used.

Pair 22. x (8·0) and ϵ (6·3) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}100$; $\mu_s = -\ 0''{\cdot}034$.

		1890									
G	300	June 8	17 14·7	7095·992	3·175	+ ·445	− ·006	− ·138	(½) 7099·61	(½) 7099·47	3 : 3
	698	Aug. 8	22 43·5	7·038	3·457	− ·201	− ·448	− ·726	099·85	099·57	2 : 2–3
	1086	Oct. 9	22 1·1	7·952	2·649	− ·662	+ ·043	+ ·231	099·98	100·17	2–3 : 2–3
	1218	„ 30	21 53·1	8·044	2·518	− ·680	+ ·196	+ ·110	(½) 100·08	(½) 099·99	3 : 3
									7099·89*	099·82	
F	177	May 3	16 45·1	7095·973	3·897	+ ·657	− ·288	− ·242	7100·24	7100·29	2 : 2–3
	826	Aug. 20	17 36·2	7·378	2·793	− ·326	+ ·139	+ ·138	(½) 099·98	(½) 099·98	3 : 3
	1113	Oct. 12	20 56·3	8·342	2·119	− ·669	+ ·451	+ ·044	(½) 100·24	(½) 099·84	3 : 3–4
	1132	„ 14	21 36·7	8·457	2·364	− ·673	+ ·037	− ·055	(½) 100·19	(½) 100·09	3–4 : 3–4
									7100·18	100·10	
An	214	Aug. 9	19 49	7097·748	1·922	− ·211	+ ·801	+ ·803	7100·26	100·26	
	319	Nov. 10	22 2·5	6·760	3·166	− ·639	+ ·204	+ ·187	099·49	099·47	
									7099·88	099·87	

* 7099″·92 used.

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TABLE III.—*continued.*

Pair 23. k (7·5) and l (8·0); $\frac{\sigma}{\Sigma_0} = 0{\cdot}464$; $\mu_s = 0''{\cdot}000$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	921	Aug. 31	17 21·0	2994·269	1·347	− ·199	+ ·058	+ ·079	2995·48	5·50	1–2 : 2–3
F	172	May 3	15 37·2	2993·326	2·250	+ ·267	− ·122	− ·088	2995·72	5·76	2 : 2–3
J	604	July 24	16 48·0	2994·055	1·521	− ·040	+ ·396	+ ·088	2995·93	5·62	2 : 3
C	96	July 16	20 57·3	2993·337	1·876	·000	+ ·046	+ ·167	2995·26	5·38	
An	227	Aug. 18	20 24·8	2993·437	2·644	− ·151	− ·092	− ·093	2995·84	5·84	

Pair 24. k (7·5) and i (7·8); $\frac{\sigma}{\Sigma_0} = 0{\cdot}265$; $\mu_s = -0''{\cdot}020$.

G	922	1890 Aug. 31	17 27·2	1708·167	0·731	− ·114	+ ·033	+ ·034	1708·82	8·82	1–2 : 2–3
F	173	May 3	15 47·6	1707·568	1·095	+ ·152	− ·069	− ·050	1708·75	8·77	2 : 2–3
J	603	July 24	16 43·2	1708·115	0·844	− ·023	+ ·226	+ ·066	1709·16	9·00	2 : 3
C	85	July 14	18 3·6	1707·739	1·002	·000	− ·005	− ·005	1708·73	8·73	
An	233	Aug. 21	19 1	1707·470	1·482	− ·093	− ·045	− ·011	1708·91	8·95	

Pair 25. y (8·2) and x (8·0); $\frac{\sigma}{\Sigma_0} = 0{\cdot}467$; $\mu_s = -0''{\cdot}041$.

G	926	1890 Aug. 31	18 3·7	3018·224	1·258	− ·185	+ ·059	− ·005	3019·36	9·29	1–2 : 2–3
F	174	May 3	16 2·4	3016·269	3·192	+ ·278	− ·122	− ·089	3019·62	9·65	2 : 2–3
J	628	July 25	22 9·5	3019·786	0·950	− ·022	−1·256	−1·187	3019·46	9·53	1–2 : 2–3
C	180	Aug. 4	20 8·8	3018·205	1·052	− ·076	+ ·042	+ ·140	3019·22	9·32	
An	216	Aug. 9	20 14	3018·001	1·271	− ·093	+ ·340	+ ·341	3019·52	9·52	

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TABLE III.—*continued.*

Pair 26. y (8·2) and γ (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}531$; $\mu_s = -0''{\cdot}024$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
			h m	″	″	″	″	″	″	″	
G	1005	1890. Sept. 23	21 2·4	3424·834	0·970	− ·287	+ ·139	+ ·127	3425·66	5·64	2 : 2–3
F	175	May 3	16 13·7	3422·689	3·290	+ ·317	− ·139	− ·101	3426·16	6·20	2 : 2–3
J	599	July 24	16 16·9	3422·550	3·288	− ·015	+ ·453	+ ·377	3426·28	6·20	2 : 3
C	193	Aug. 6	20 1·1	3425·167	1·103	− ·089	+ ·048	·000	3426·23	6·18	
An	238	Aug. 21	20 11·5	3424·268	1·339	− ·161	− ·090	− ·159	3425·36	5·29	

Pair 27. Beyond range of Measurement.

Pair 28. δ (8·2) and ζ (8·1) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}764$; $\mu_s = +0''{\cdot}126$.

G	849	1890. Aug. 21	22 16·2	4928·666	2·244	− ·231	− ·027	− ·076	0·65	0·60	1–2 : 2–3
	876	„ 26	21 26·7	9·051	1·905	− ·265	− ·080	− ·076	(½) 0·61	(½) 0·62	3 : 3–4
									4930·64	0·61	
F	191	May 9	17 2·3	4928·576	1·725	+ ·448	− ·004	− ·134	4930·75	0·62	1–2 : 2–3
J	590	July 22	22 29·6	4928·629	2·359	− ·003	+0·955	+ ·863	(4931·94)	(1·85)	1 : 2 Rejected.
C	217	Aug. 15	20 19·3	4928·017	2·904	− ·190	+ ·069	+ ·260	0·80	0·99	
	347	Sept. 5	21 8·8	7·877	2·866	− ·317	+ ·435	+ ·596	0·87	1·03	
	421	„ 24	21 32·9	8·740	3·043	− ·418	+ ·336	+ ·405	(1·71)	(1·75)	Rejected.
									4930·84	1·01	

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TABLE III.—*continued.*

Pair 29. ϵ (6·3) and γ (7·8); $\frac{\sigma}{\Sigma_0} = 0{\cdot}423$; $\mu_s = +\ 0''{\cdot}011$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	994	Sept. 18	22 30·2	2732·997	1·483	— ·215	+ ·038	— ·063	(½) 4·30	(½) 4·20	2-3 : 3-4
	1267	Nov. 11	23 19·7	2·181	2·025	— ·245	+ ·232	...	(½) 4·19	(½) 4·19	3-4 : 3-4
									2734·26	4·20	
F	256	May 28	16 58·0	2733·143	0·847	+ ·207	·000	— ·072	(½) 2734·20	(½) 4·13	3-4 : 3-4
J	602	July 24	16 37·2	2732·779	0·862	— ·008	+ ·361	+ ·148	2733·99	3·75	2 : 3
C	222	Aug. 16	19 6·9	2731·732	1·611	— ·101	+ ·081	+ ·081	2733·32	3·32	
An	251	Aug. 22	22 8·5	2732·329	2·032	— ·129	— ·134	— ·195	2734·10	4·14	

Pair 30. ϵ (6·3) and θ (8·5); $\frac{\sigma}{\Sigma_0} = 0{\cdot}991$; $\mu_s = +\ 0''{\cdot}005$.

		1890									
G	579	July 22	17 17·9	6399·644	2·000	+ ·003	+ ·347	+ ·347	1·99	1·99	1 : 2
	894	Aug. 28	21 29·3	9·859	2·680	— ·355	— ·248	— ·327	1·94	1·86	2 : 2
									6401·96*	1·93	
F	193	May 9	17 26·3	6399·166	2·008	+ ·582	— ·005	— ·050	1·75	1·71	1-2 : 2-3
	1051	Oct. 6	21 20·8	9·797	2·621	— ·589	+ ·174	+ ·347	2·00	2·18	1 : 2-3
									6401·88	1·95	
C	227	Aug. 16	20 37·3	6399·330	3·259	— ·241	+ ·188	+ ·188	2·54	2·54	
	353(*a*)	Sept. 7	19 5·4	7·769	3·956	— ·431	— ·040	+ ·317	1·26	1·62	
									6401·90	2·08	
S	56	July 10	18 13·5	6394·677	7·675	+ ·125	— ·310	— ·466	2·15	1·99	
	163	Oct. 14	20 35·5	7·858	4·989	— ·608	— ·261	— ·268	1·98	1·97	
									6402·07	1·98	

* 6401″·95 used.

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TABLE III.—*continued.*

Pair 31. ζ (8·1) and α (8·2) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}003$; $\mu_s = +\ 0''{\cdot}110$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	″	″	″	″	″	″	″	
G	8	Sept. 2	17 57·4	6478·051	1·839	— ·412	+ ·397	+ ·391	79·88	79·87	(2 : 2–3)
	20	„ 3	22 4·9	7·418	3·118	— ·420	+ ·122	+ ·160	80·24	80·28	2–3 : 3
		1890									
	411	July 8	22 29·3	6·118	3·580	+ ·136	+ ·103	...	79·94	[79·94]	2 : 2–3
	850	Aug. 21	22 24·9	6·984	3·517	— ·307	— ·036	— ·140	80·16	80·05	1–2 : 2–3
	1222	Oct. 30	22 32·8	7·197	3·557	— ·617	+ ·179	+ ·080	(½) 80·32	(½) 80·22	3 : 3
									6480·08	80·06	
F	276	June 3	17 4·0	6477·655	1·828	+ ·449	— ·020	+ ·140	79·91	80·07	2 : 2–3
	829	Aug. 20	18 8·6	7·998	1·839	— ·298	+ ·126	+ ·361	(½) 79·67	(½) 79·90	3 : 3
	1189	Oct. 23	21 39·1	7·940	2·772	— ·624	— ·060	+ ·150	(½) 79·98	(½) 80·19	2–3 : 3–4
									6479·87	80·06	
C	211	Aug. 15	18 24·2	6475·657	4·476	— ·241	+ ·090	+ ·231	79·99	80·13	
	343	Sept. 4	21 12·0	8·081	2·536	— ·418	+ ·320	+ ·431	80·52	80·63	
									6480·26	80·38	
An.	258	Aug. 30	19 45	6475·745	4·673	— ·386	+ ·271	+ ·181	6480·30	0·21	

Pair 32. ζ (8·1) and κ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}615$; $\mu_s = -\ 0''{\cdot}016$.

G	7	1889 Sept. 2	17 48·5	3968·813	1·188	— ·249	+ ·244	+ ·221	70·00	69·97	(2 : 3)
		1890									
	412	July 8	22 43·7	8·291	2·238	+ ·090	+ ·063	...	70·68	[70·68]	2 : 2–3
	851	Aug. 21	22 34·3	8·613	2·119	— ·284	— ·022	— ·104	70·43	70·34	1–2 : 2–3
	1088	Oct. 9	22 20·9	8·694	1·910	— ·374	+ ·024	+ ·055	70·25	70·29	2–3 : 2–3
	1220	„ 30	22 12·9	9·075	1·797	— ·381	+ ·109	+ ·049	(½) 70·60	(½) 70·54	3 : 3
									3970·37	70·34	
F	277	June 3	17 15·5	3968·916	1·295	+ ·281	— ·012	+ ·074	0·48	0·57	2 : 2–3
	1046	Oct. 4	22 8·8	8·785	1·776	— ·364	— ·004	·000	0·19	0·20	2 : 3
	1166	„ 18	22 13·4	9·187	1·809	— ·383	— ·095	— ·123	(½) 0·52	(½) 0·49	3 : 3–4
	1188	„ 23	21 27·8	9·227	1·451	— ·384	— ·037	+ ·068	(½) 0·26	(½) 0·36	3 : 3–4
									3970·35	70·40	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	232	Aug. 18	19 38·4	3969·516	1·522	— ·165	+ ·160	+ ·160	1·03	1·03	
	354	Sept. 7	19 29·6	8·932	1·573	— ·266	— ·025	+ ·178	0·22	0·42	
									3970·63	0·73	
An.	257	Aug. 30	19 35·3	3968·536	1·942	— ·233	+ ·166	+ ·092	0·41	0·34	
	320	Nov. 10	22 13	9·248	1·146	— ·365	+ ·114	+ ·135	0·14	0·16	
									3970·28	0·25	

Pair 33. g (8·5) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}679$; $\mu_s = +\ 0''{\cdot}064$.

G	986	1890 Sept. 18	20 51·8	4382·287	1·236	— ·371	+ ·060	+ ·265	(½)4383·21	(½) 3·42	2–3 : 3–4
F	184	May 9	15 44·1	4378·680	4·451	+ ·370	— ·003	— ·054	4383·50	3·45	1–2 : 3
J	596	July 24	15 52·2	4378·864	4·078	— ·067	+ ·579	+ ·862	4383·45	3·74	2 : 3
C	20	June 28	19 57·6	4382·260	1·535	+ ·101	+ ·109	+ ·109	4·01	4·01	
	443	Oct. 8	20 31·0	1·195	1·864	— ·418	— ·048	+ ·034	(½) 2·59	(½) 2·67	3–4 : 3–4
									4383·54	3·56	
An	314	Sept. 13	23 0	4375·798	8·851	— ·353	+ ·016	+ ·048	(4384·31)	(4·34)	Rejected.

Pair 34. g (8·5) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}325$; $\mu_s = +\ 0''{\cdot}010$.

G	988	1890 Sept. 18	21 21·1	2094·907	0·645	— ·176	+ ·029	+ ·088	2095·41	5·46	2–3 : 3–4
F	183	May 9	15 30·4	2092·712	2·490	+ ·179	— ·002	+ ·016	2095·38	5·40	1–2 : 3
J	631	July 25	22 34·0	2095·620	0·923	— ·032	— ·873	— ·913	2095·64	5·60	1–2 : 2–3
C	63	July 9	19 51·3	2094·843	0·659	+ ·025	— ·026	— ·033	2095·50	5·50	
An	229	Aug. 18	20 43·3	2094·451	0·865	— ·107	— ·064	— ·085	2095·16	5·13	

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TABLE III.—*continued.*

Pair 35. E (8·0) and *b* (8·3) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}047$; $\mu_s = +\ 0''{\cdot}018$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	285	June 5	16 14·9	6701·628	4·107	+ ·391	− ·109	− ·157	6·02	5·97	2 : 2
	865	Aug. 25	21 39·2	4·434	2·445	− ·419	− ·108	− ·063	6·35	6·40	2 : 2–3
									6706·19	6·19	
F	254	May 28	16 15·7	6701·737	4·111	+ ·456	·000	+ ·063	(½) 6·30	(½) 6·37	3 : 3–4
	1053	Oct. 6	22 5·0	4·124	2·816	− ·640	+ ·184	− ·079	(½) 6·48	(½) 6·22	3 : 2–3
									6706·39	6·30	
C	15	June 27	20 17·9	6704·932	2·092	+ ·178	− ·115	− ·126	7·08	7·07	
	440	Oct. 5	21 40·0	3·612	3·271	− ·647	− ·126	− ·147	6·11	6·09	3–4 : 3–4
									6706·60	6·58	
An	274	Sept. 1	22 46	6699·328	7·587	− ·474	− ·015	− ·105	6706·43	6·34	

Pair 36. E (8·0) and *n* (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}609$; $\mu_s = -\ 0''{\cdot}009$.

G	110	1890 Apr. 17	16 43·9	3983·880	2·310	+ ·376	− ·049	− ·015	(½) 3986·52	(½) 6·55	3 : 2–3
	866	Aug. 25	21 48·5	5·676	1·174	− ·235	− ·063	− ·030	6·55	6·59	2 : 2–3
	1013	Sept. 26	21 34·2	5·336	1·130	− ·353	− ·130	− ·091	(½) 5·98	(½) 6·02	3 : 3
									3986·40	6·44	
F	185	May 9	15 55·5	3982·473	3·752	+ ·339	− ·003	− ·073	6·56	6·49	1–2 : 3
	1078	Oct. 8	22 26·5	5·455	1·303	− ·373	− ·066	− ·411	(½) 6·32	(½) 5·97	2–3 : 3–4
									3986·48	6·32	
J	597	July 24	16 1·8	3982·429	3·525	− ·053	+ ·519	+ ·639	3986·42	6·54	(2 : 3)
C	84	July 14	17 38·0	3985·050	1·103	+ ·013	− ·012	...	6·16	[6·16]	
	263	Aug. 27	18 32·1	5·278	1·154	− ·241	− ·091	− ·152	6·10	6·04	
	383	Sept. 19	19 43·5	4·974	1·420	− ·330	+ ·317	+ ·317	6·39	6·39	
									3986·22	6·20	
An	262	Aug. 30	20 30·5	3984·208	2·197	− ·259	+ ·164	+ ·177	3986·31	6·32	

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TABLE III.—*continued.*

Pair 37. F (8·3) and s (7·8) ; $\frac{\sigma}{\Sigma_0}$ = 0·890 ; μ_s = + 0″·021.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	112	Apr. 17	17 9·7	5713·236	1·714	+ ·549	— ·071	— ·111	(½) 5·43	(½) 5·39	3 : 2–3
	315	June 11	16 24·1	3·120	2·055	+ ·324	+ ·008	+ ·111	5·51	5·61	2–3 : 3
	465	July 13	16 22·8	2·959	2·091	+ ·054	+ ·076	+ ·134	5·18	5·24	2 : 2
	844	Aug. 21	21 29·1	3·389	2·433	— ·290	— ·032	— ·053	5·50	5·48	1–2 : 2–3
	1018	Sept. 26	22 28·7	2·973	3·355	— ·505	— ·190	— ·214	5·63	5·61	2–3 : 2–3
									5715·45*	5·47	
F	189	May 9	16 39·8	5713·094	1·971	+ ·509	— ·004	— ·196	5·57	5·38	1–2 : 2–3
	918	Aug. 29	22 21·0	3·344	3·252	— ·351	— ·427	— ·605	5·82	5·64	2 : 3 faint
	1167	Oct. 18	22 22·6	3·304	3·202	— ·549	— ·137	— ·245	(½) 5·82	(½) 5·71	3 : 3
									5715·72	5·55	
C	135	July 20	19 50·4	5713·776	2·016	— ·013	+ ·009	— ·046	5·79	5·73	
	301	Aug. 31	19 24·9	3·853	2·207	— ·355	+ ·285	+ ·329	6·00	6·04	
	401	Sept. 20	21 13·2	3·586	1·662	— ·469	+ ·249	+ ·134	5·03	4·91	
	419	,, 24	21 0·1	4·258	1·738	— ·494	+ ·392	+ ·418	5·89	5·92	
									5715·68	5·65	
An	287	Sept. 3	22 25·8	5713·718	1·624	— ·384	+ ·218	+ ·223	5715·17	5·18	

* 5715″·46 used.

Pair 38. F (8·3) and α (8·2) ; $\frac{\sigma}{\Sigma_0}$ = 0·696 ; μ_s = — 0″·052.

		1890									
G	111	Apr. 17	16 57·1	4533·317	1·674	+ ·432	— ·056	— ·049	(½) 5·37	(½) 5·37	3 : 2–3
	302	June 8	17 32·2	4·010	1·476	+ ·279	— ·004	— ·104	(½) 5·76	(½) 5·66	3 : 3
	466	July 13	16 37·0	3·664	1·951	+ ·015	+ ·059	+ ·087	5·69	5·72	2 : 2
	846	Aug. 21	21 48·7	4·083	1·886	— ·220	— ·025	— ·007	5·72	5·74	1–2 : 2–3
	1017	Sept. 26	22 14·5	4·344	2·117	— ·394	— ·148	— ·153	5·92	5·91	2–3 : 2–3
									4535·72*	5·72	
F	190	May 9	16 49·1	4533·635	1·835	+ ·403	— ·003	— ·139	5·87	5·73	1–2 : 2–3
	911	Aug. 29	18 12·2	4·606	1·342	— ·268	— ·076	— ·452	5·60	5·23	2 : 3
	1168	Oct. 18	22 32·2	4·386	2·375	— ·432	— ·107	— ·244	(¼) 6·22	(¼) 6·09	3–4 : 3–4
									4535·79	5·59	
C	171	Aug. 3	19 48·2	4534·117	1·395	— ·089	— ·320	— ·265	5·10	5·15	
	328	Sept. 3	20 51·1	5·512	1·255	— ·292	+ ·084	+ ·160	6·56	6·64	
	367	,, 8	20 33·2	4·358	1·268	— ·317	+ ·404	+ ·404	5·71	5·71	
	406	,, 23	20 5·2	5·131	1·319	— ·380	+ ·125	+ ·125	6·20	6·20	
									4535·89	5·93	
An	275	Sept. 1	22 57·0	4534·769	1·649	— ·285	— ·009	— ·084	4536·12	6·05	

* 4535″·74 used.

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TABLE III.—*continued.*

Pair 39. s (7·8) and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 1·039$; $\mu_s = -0''·004$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	140	Apr. 29	15 59·3	6695·028	5·315	+ ·620	+ ·428	+ ·598	(½) 6701·39	(½) 1·56	3 : 3
	463	July 13	16 3·9	6·120	5·140	+ ·044	+ ·088	+ ·182	1·39	1·49	2 : 2
	794	Aug. 17	21 38·5	9·385	2·296	— ·315	— ·037	+ ·005	1·33	1·27	2 : 2–3
	997	Sept. 21	20 50·4	9·595	2·022	— ·572	+ ·239	+ ·312	1·28	1·36	2 : 2–3
	1263	Nov. 10	23 5·1	8·220	3·899	— ·588	+ ·544	...	(¼) 2·08	(¼) [2·08]	3–4 : 3–4
	1264	„ 10	23 15·3	7·553	4·293	— ·588	+ ·544	...	(¼) 1·80	(¼) [1·80]	4 : 4
									6701·45	1·50	
F	186	May 9	16 8·5	6696·666	4·963	+ ·585	— ·005	— ·197	(½) 2·21	(½) 2·02	1–2 : 3
	822	Aug. 20	16 43·0	8·178	3·571	— ·343	+ ·131	— ·218	(½) 1·54	(½) 1·19	Ex. bad
									6701·99	1·74	
C	108	July 18	18 34·7	6699·058	1·927	— ·013	+ ·094	+ ·197	1·07	1·18	
	274	Aug. 27	21 2·7	9·136	2·371	— ·405	— ·156	+ ·208	0·94	1·31	
	388	Sept. 19	20 37·5	9·214	2·143	— ·558	+ ·541	+ ·540	1·34	1·34	
									6701·12	1·28	
S	108	Sept. 8	21 27·5	6699·975	2·992	— ·496	—1·074	—1·195	6701·40	1·28	

Pair 40. s (7·8) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0·853$; $\mu_s = -0''·029$.

		1890									
G	464	July 13	16 13·8	5500·797	4·920	+ ·052	+ ·072	+ ·136	5·84	5·91	2 : 2
	845	Aug. 21	21 38·9	3·978	1·639	— ·276	— ·031	+ ·021	5·31	5·36	1–2 : 2–3
									5505·58	5·64	
F	188	May 9	16 30·6	5501·251	4·219	+ ·486	— ·004	— ·188	5·95	5·77	1–2 : 2–3
	823	Aug. 20	16 56·1	3·329	3·312	— ·268	+ ·107	— ·107	(¼) 6·48	(¼) 6·27	Ex. bad
									5506·06	5·87	
C	136	July 20	20 12·3	5503·346	2·042	— ·013	+ ·008	— ·068	5·39	5·31	
	302	Aug. 31	19 42·6	3·891	1·838	— ·343	+ ·273	+ ·264	5·66	5·65	
									5505·53	5·48	
An	288	Sept. 3	22 35·0	5499·089	6·919	— ·367	+ ·209	+ ·213	5505·85	5·85	

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TABLE III.—*continued.*

Pair 41. r (7·8) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}871$; $\mu_s = -0''{\cdot}018$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	407	July 4	16 42·3	5620·069	3·347	+ ·118	+ ·194	+ ·157	3·73	3·69	2 : 2 faint
	802	Aug. 19	17 0·4	1·092	2·936	− ·276	+ ·196	+ ·096	(½) 3·95	(½) 3·85	2–3 : 3–4
									5623·80	3·74	
F	211	May 17	15 47·5	5617·473	5·835	+ ·455	− ·102	...	3·66	[3·66]	(2 : 2)
	871	Aug. 26	17 17·5	21·740	2·574	− ·328	+ ·118	+ ·105	(½) 4·10	(½) 4·09	3–4 : 3–4
									5623·75	3·75	
C	112	July 18	20 12·5	5622·028	1·800	− ·013	+ ·078	·000	3·90	3·82	
	278	Aug. 28	18 55·9	2·269	1·547	− ·343	+ ·148	+ ·148	3·63	3·63	
									5623·77	3·73	
S	109	Sept. 8	21 41	5621·569	3·228	− ·411	− ·901	−1·097	5623·49	3·29	

Pair 42. r (7·8) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}036$; $\mu_s = -0''{\cdot}052$.

		1890									
G	426	July 10	16 11·0	6684·440	2·530	+ ·095	+ ·157	+ ·218	(½) 7·22	(½) 7·28	3 : 2–3
	804	Aug. 19	17 15·1	5·292	2·014	− ·314	+ ·233	+ ·083	7·23	7·08	2–3 : 3–4
									6687·23	7·15	
F	271	June 3	15 43·8	6684·231	3·053	+ ·440	− ·021	− ·062	7·70	7·66	2 : 3
	872	Aug. 26	17 32·4	5·589	1·922	− ·377	+ ·141	+ ·145	(½) 7·28	(½) 7·28	3–4 : 3–4
									6687·62	7·58	
C	130	July 20	18 14·8	6683·246	3·525	− ·013	+ ·010	+ ·083	6·77	6·84	
	295	Aug. 30	20 17·6	5·694	2·105	− ·418	+ ·208	+ ·166	7·59	7·55	
	399	Sept. 20	20 43·0	5·858	2·029	− ·558	+ ·290	+ ·280	7·62	7·61	
									6687·33	7·33	
An	292	Sept. 10	19 45·3	6685·023	2·799	− ·494	+ ·008	+ ·010	6687·34	7·34	

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TABLE III.—*continued.*

Pair 43. γ (7·8) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}323$; $\mu_s = +\ 0''{\cdot}035$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	′	′	
G	993	Sept. 18	22 17·0	2086·636	0·808	— ·165	+ ·029	— ·013	2087·31	7·27	2–3 : 3–4
F	328	June 12	15 24·3	2084·727	3·389	+ ·122	— ·559	— ·568	2087·68	7·67	1–2 : 2
J	650	Aug. 2	17 25·8	2086·027	0·929	— ·038	+ ·250	+ ·242	2087·17	7·16	1–2 : 1–2
C	212	Aug. 15	18 52·4	2086·549	0·596	— ·076	+ ·029	+ ·120	2087·10	7·19	
An	294	Sept. 10	20 14·0	2087·473	0·592	— ·149	+ ·003	+ ·003	2087·92	7·92	

Pair 44. γ (8·2) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}381$; $\mu_s = -\ 0''{\cdot}069$.

G	1006	1890 Sept. 23	21 9·7	2457·089	0·910	— ·204	+ ·100	+ ·099	2457·90	7·89	2 : 2–3
F	278	June 3	17 28·7	2456·938	0·748	+ ·171	— ·008	+ ·029	2457·85	7·89	2 : 2–3
J	651	Aug. 2	17 33·5	2457·002	0·747	— ·042	+ ·295	+ ·286	2458·00	7·99	1–2 : 1–2
C	214	Aug. 15	19 33·2	2457·040	0·913	— ·089	+ ·034	+ ·183	2457·90	8·05	
An	293	Sept. 10	20 2·0	2457·340	0·996	— ·174	+ ·003	+ ·004	2458·27	8·27	

Pair 45. w (8·0) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}729$; $\mu_s = +\ 0''{\cdot}009$.

G	539	1890 July 19	15 56·0	4699·631	4·904	+ ·011	+ ·396	...	4·94	[4·94]	(2 : 2–3)
	1107	Oct. 11	21 55·9	4703·459	1·586	— ·442	+ ·060	+ ·109	(¼) 4·66	(¼) 4·71	3–4 : 3
									4704·88	4·89	
F	280	June 3	17 49·2	4702·424	1·876	+ ·319	— ·014	·000	4704·60	4·62	2 : 2–3
C	177	Aug. 4	19 20·7	4703·105	1·268	— ·114	+ ·066	+ ·394	4·33	4·65	
	448	Oct. 8	22 22·0	1·989	2·841	— ·443	— ·051	— ·223	4·34	4·17	
									4704·34	4·41	
An	299	Sept. 10	21 43·8	4702·658	2·277	— ·342	+ ·006	+ ·007	4704·61	4·61	

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TABLE III.—*continued.*

Pair 46. *w* (8·0) and *v* (6·5) ; $\frac{\sigma}{\Sigma_0}$ = 0·355 ; μ_s = − 0″·040.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	540	July 19	16 11·6	2292·279	1·927	+ ·002	+ ·193	...	4·45	[4·45]	(2 : 2–3)
	801	Aug. 19	16 50·4	3·264	1·317	− ·106	+ ·080	+ ·050	(½) 4·56	(½) 4·53	2–3 : 3–4
									2294·49	4·48	
F	325	June 11	23 17·6	2292·979	1·301	+ ·130	− ·154	− ·160	(½) 4·26	(½) 4·25	3 : 3
	1142	Oct. 16	21 47·2	3·774	0·730	− ·218	+ ·017	+ ·014	(½) 4·35	(½) 4·30	2–3 : 3 faint
									2294·31	4·28	
C	318	Sept. 1	20 40·6	2293·720	0·774	− ·152	+ ·046	+ ·050	2294·39	4·39	
	402	„ 20	21 27·5	3·314	0·977	− ·190	+ ·099	+ ·032	4·20	4·13	
									2294·30	4·26	
An	297	Sept. 10	21 26·5	2293·712	1·051	− ·168	+ ·003	+ ·004	2294·60	4·60	

Pair 47. *n* (6·8) and *i* (8·0) ; $\frac{\sigma}{\Sigma_0}$ = 0·647 ; μ_s = − 0″·008.

G	791	1890 Aug. 17	21 14·0	4174·734	1·774	− ·203	− ·023	− ·016	6·28	6·29	2 : 2–3
	814	„ 19	21 6·4	4·899	1·706	− ·215	− ·030	+ ·019	6·36	6·41	(2 : 3)
									4176·32	6·35	
F	255	May 28	16 32·3	4174·748	1·272	+ ·288	·000	− ·016	(½) 4176·31	(½) 6·29	3 : 3–4
C	87	July 14	18 24·4	4174·480	1·953	+ ·013	− ·013	...	4176·44	[6·44]	
An	303	Sept. 10	22 41·8	4175·127	1·251	− ·321	+ ·005	+ ·006	4176·06	6·06	

Pair 48. *n* (6·8) and *o* (7·5) ; $\frac{\sigma}{\Sigma_0}$ = 0·790 ; μ_s = + 0″·016.

G	295	1890 June 8	16 0·3	5097·550	2·965	+ ·289	−0·005	+ ·040	(½) 0·80	(½) 0·84	3–4 : 3–4
	774	Aug. 17	16 31·9	9·182	2·565	− ·245	+ ·119	+ ·099	1·62	1·60	2 : 3
									5101·46*	1·45†	

* 5101″·48 used. † 1″·47 used.

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	273	June 3	16 19·4	5098·919	2·694	+ ·320	— ·016	+ ·095	1·92	2·03	2 : 3
	947	Sept. 1	22 25·9	9·988	2·138	— ·342	— ·087	— ·040	(½) 1·70	(½) 1·74	3 : 3-4
									5101·85	1·93	
C	104	July 17	20 32·6	5098·085	3·043	·000	— ·079	— ·213	1·05	0·92	
	270	Aug. 27	20 7·3	8·856	2·993	— ·304	— ·119	— ·142	1·43	1·41	
									5101·24	1·17	
An	300	Sept. 10	21 56·5	5096·004	6·614	— ·390	+ ·006	+ ·008	5102·23	2·24	

Pair 49. i (7·8) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0·320$; $\mu_s = -0''·007$.

		1890									
G	306	June 10	21 57·6	2061·835	1·147	+ ·108	— ·022	...	3·07	[3·07]	1-2 : 2-3
	1093	Oct. 9	23 7·4	1·592	1·924	— ·195	+ ·012	— ·104	3·33	3·22	2-3 : 2-3
	1223	„ 30	22 42·1	1·639	1·514	— ·190	+ ·057	+ ·029	(½) 3·02	(½) 2·99	3 : 3
									2063·16	3·11	
F	252	May 28	15 48·1	2062·766	0·583	+ ·141	·000	+ ·072	(½)2063·49	(½) 3·56	3 : 3-4
C	73	July 11	19 50·3	2062·861	0·939	+ ·013	+ ·099	+ ·099	2063·91	3·91	
An	305	Sept. 13	19 56·5	2062·033	1·325	— ·166	+ ·007	+ ·013	2063·20	3·21	

Pair 50. b (8·3) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 0·712$; $\mu_s = +0''·006$.

		1890									
G	311	June 11	15 41·5	4591·468	3·172	+ ·224	+ ·006	— ·021	4·87	4·84	2-3 : 3
	775	Aug. 17	16 39·9	2·066	2·298	— ·241	+ ·107	+ ·078	4·23	4·20	2 : 3
									4594·55*	4·52	
F	272	June 3	16 5·8	4591·380	2·703	+ ·272	— ·014	+ ·043	4·34	4·40	2 : 3
	1159	Oct. 18	21 8·3	3·160	1·582	— ·437	— ·110	+ ·107	4·20	4·41	1-2 : 2
									4594·27	4·41	

* 4594″·57 used.

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	9	June 26	18 46·7	4591·955	2·574	+ ·127	+ ·185	+ ·185	4·85	4·85	
	240	Aug. 23	18 32·5	1·574	2·637	— ·279	— ·057	— ·178	3·87	3·75	
									4594·36	4·30	
An	306	Sept. 13	20 9·8	4590·168	4·544	— ·377	+ ·016	+ 0·64	4594·35	4·40	

Pair 51. *b* (8·3) and *a* (7·7) ; $\frac{\sigma}{\Sigma_0}$ 0·335 ; $\mu_s = -0''\cdot015$.

		1890									
G	312	June 11	15 51·3	2158·663	0·612	+ ·104	+ ·003	+ ·003	9·38	9·38	2–3 : 3
	788	Aug. 17	20 51·7	8·807	0·890	— ·114	— ·012	— ·017	9·57	9·57	2 : 2–3
	811	„ 19	20 40·6	8·870	0·852	— ·119	— ·015	+ ·033	9·59	9·64	(2 : 3)
									2159·51*	9·53	
F	253	May 28	16 3·2	2158·567	0·617	+ ·142	·000	+ ·044	2159·33	9·37	2–3 : 3–4
C	(2)	June 25	18 51·0	2158·083	1·065	+ ·063	+ ·074	+ ·074	9·28	9·28	
	194	Aug. 6	20 23·8	8·248	0·824	— ·076	+ ·030	·000	9·03	9·00	
									2159·16	9·14	
An	307	Sept. 13	20 22·5	2158·471	1·199	— ·177	+ ·008	+ ·044	2159·50	9·54	

* 2159″·52 used.

Pair 52. *f* (7·6) and *i* (7·8) ; $\frac{\sigma}{\Sigma_0}$ 0·395 ; $\mu_s = +0''\cdot018$.

		1890									
G	789	Aug. 17	20 59·1	2552·766	0·845	— ·128	— ·014	— ·020	2553·47	3·46	2 : 2–3
F	274	June 3	16 32·5	2551·727	1·250	+ ·156	— ·008	+ ·059	2553·13	3·19	2 : 3
J	648	Aug. 2	17 9·8	2551·991	1·001	— ·072	+ ·306	+ ·304	2553·23	3·22	1–2 : 1–2
C	48	July 6	20 40·1	2552·123	0·761	+ ·038	— ·055	— ·055	2552·86	2·86	
S	3	May 19	17 28·0	2551·938	1·092	+ ·197	— ·388	— ·423	2552·84	2·80	

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TABLE III.—*continued.*

Pair 53. f (7·6) and a (7·7) ; $\frac{\sigma}{\Sigma_0} = 1·044$; $= \mu_s\ 0''·000$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
			h m	″	″	″	″	″	″	″	
G	38	1889 Sept. 6	21 45·6	6738·375	1·999	− ·509	+ ·385	+ ·376	40·25	0·24	2–3 : 3
	787	1890 Aug. 17	20 44·8	8·912	1·897	− ·349	− ·038	− ·063	40·42	0·40	2 : 2–3
	1092	Oct. 9	22 57·4	8·662	2·451	− ·638	+ ·041	− ·235	40·52	0·24	2–3 : 2–3
									6740·40	0·29	
F	290	June 6	16 49·3	6736·465	3·783	+ ·375	− ·070	− ·131	6740·55	0·49	2–3 : 3
C	8	June 26	18 1·6	6738·397	1·940	+ ·190	+ ·271	+ ·271	40·80	40·80	
	429	Sept. 25	20 57·0	6·571	3·791	− ·608	+ ·209	− ·699	39·97	39·06	
									6740·39	39·93	
An	187	May 22	117 58·5	6738·269	2·280	+ ·493	+ ·063	+ ·094	6741·11	1·14	

Pair 54. p (7·7) and q (8·3) ; $\frac{\sigma}{\Sigma_0} = 0·499$; $\mu_s = +\ 0''·005$.

G	142	1890 Apr. 29	16 17·6	3222·560	1·498	+ ·298	+ ·206	+ ·286	4·55	4·64	2–3 : 3
	525	July 17	23 25·1	1·501	3·411	+ ·001	+ ·012	− ·125	4·95	4·79	1–2 : 2–3
	796	Aug. 17	21 56·0	3·551	1·496	− ·152	− ·018	+ ·012	4·88	4·91	2 : 2–3
	1007	Sept. 23	21 19·8	3·975	1·241	− ·280	+ ·131	+ ·150	5·07	5·09	2 : 2–3
									3224·86	4·86	
F	324	June 11	22 51·7	3223·012	2·279	+ ·174	− ·216	− ·205	(½) 5·25	(½) 5·26	3 : 3
	936	Sept. 1	17 32·8	4·267	1·024	− ·214	+ ·229	+ ·237	(½) 5·31	(½) 5·36	3 : 3
									3225·28	5·31	
C	113	July 18	20 33·8	3223·626	0·901	− ·013	+ ·045	− ·020	4·56	4·49	
	279	Aug. 28	19 6·4	4·133	1·039	− ·190	+ ·085	+ ·085	5·07	5·07	
	389	Sept. 19	20 49·8	4·285	0·888	− ·266	+ ·260	+ ·259	5·17	5·17	
									3224·93	4·91	
S	113	Sept. 17	20 34·5	3224·642	0·891	− ·266	− ·393	− ·434	3224·87	4·83	
An	194	May 23	17 9·0	3222·823	2·493	+ ·244	− ·153	− ·319	3225·41	5·24	

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TABLE III.—*continued.*

Pair 55. p (7·7) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}701$; $\mu_s = -0''{\cdot}057$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	468	July 13	16 58·5	4522·936	2·003	+ ·022	+ ·060	+ ·053	4525·02	5·01	2 : 2
F	288	June 6	15 53·8	4521·669	3·390	+ ·265	− ·047	− ·014	(½) 5·28	(½) 5·31	2–3 : 3–4
	1261	Nov. 8	23 1·9	2·828	2·981	− ·397	+ ·045	...	(½) 5·46	(½) [5·46]	3 : 2–3
									4525·37	5·39	
J	475	July 13	23 20·0	4520·029	3·720	+ ·022	+1·173	+1·108	4·94	4·88	2 : 2 faint
	492	„ 16	21 53·3	2·256	1·873	+ ·001	+1·464	+1·009	5·59	5·14	1 : 2
									4525·27	5·01	
C	94	July 16	20 19·8	4523·642	1·293	+ ·013	+ ·070	+ ·196	5·02	5·15	
	265	Aug. 27	18 59·7	3·946	1·255	− ·279	− ·105	− ·210	4·81	4·71	
									4524·92	4·93	
S	116	Sept. 17	21 30·5	4524·247	1·718	− ·374	− ·552	− ·540	4525·04	5·05	
An	201	May 23	18 29·5	4522·985	1·378	+ ·337	− ·215	− ·007	4524·49	4·69	

Pair 56. q (8·3) and s (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}529$; $\mu_s = -0''{\cdot}006$.

		1890									
G	144	Apr. 29	16 37·3	3412·111	0·952	+ ·315	+ ·218	+ ·275	3·60	3·65	2–3 : 3
	797	Aug. 17	22 2·5	1·981	1·826	− ·156	− ·019	+ ·016	3·63	3·67	2 : 2–3
	900	„ 28	22 19·6	2·199	2·042	− ·205	− ·132	− ·238	3·90	3·80	2 : 2
									3413·71	3·71	
F	329	June 12	15 37·9	3413·651	0·998	+ ·183	− ·916	− ·939	3·92	3·89	1–2 : 2
	937	Sept. 1	17 41·0	2·886	0·971	− ·222	+ ·243	+ ·265	(½) 3·88	(½) 3·90	3 : 3
									3413·91	3·89	
J	528	July 18	15 40·4	3411·738	0·981	·000	+ ·820	+ ·926	3413·54	3·65	2 3 : 2
C	119	July 19	18 17·3	3411·433	2·143	− ·013	+ ·185	+ ·407	3·75	3·97	
	288	Aug. 30	18 47·9	1·965	1·826	− ·216	+ ·106	+ ·148	3·69	3·73	
	394	Sept. 20	19 46·3	2·966	1·522	− ·279	+ ·148	+ ·259	4·36	4·47	
									3413·93	4·06	
S	118	Sept. 17	21 54·0	3412·788	1·661	− ·278	− ·416	− ·381	3413·76	3·79	
An	207	May 24	17 46·0	3410·151	3·728	+ ·258	+ ·167	+ ·164	3414·30	4·30	

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TABLE III.—*continued.*

Pair 57. q (8·3) and r (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}526$; $\mu_s = +\ 0''{\cdot}001$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	143	Apr. 29	16 26·4	3395·606	2·374	+ ·313	+ ·217	+ ·289	8·51	8·58	2–3 : 3
	816	Aug. 19	21 27·8	7·664	1·083	— ·164	— ·024	— ·016	8·56	8·57	(2 : 3)
	902	„ 28	22 34·7	7·702	1·077	— ·204	— ·132	— ·224	8·44	8·35	2–3 : 2–3
									3398·50	8·50	
F	330	June 12	15 49·5	3395·982	3·366	+ ·182	— ·911	— ·933	8·62	8·60	1–2 : 2
	939	Sept. 1	18 0·3	7·364	1·496	— ·221	+ ·242	+ ·305	(½) 8·88	(½) 8·94	3 : 3
									3398·71	8·71	
J	588	July 22	22 14·0	3397·041	1·095	— ·022	+ ·656	+ ·689	3398·77*	8·80	1 : 2
C	118	July 19	18 2·4	3397·319	1·560	— ·013	+ ·184	+ ·395	9·05	9·27	
	287	Aug. 30	18 35·9	7·699	1·573	— ·216	+ ·105	+ ·142	9·17	9·20	
	391	Sept. 19	21 15·7	6·710	2·307	— ·279	+ ·274	+ ·274	9·01	9·01	
									3399·08	9·16	
S	11	May 28	17 19·0	3396·287	2·562	+ ·241	— ·257	— ·252	8·83	8·84	
	133	Oct. 3	21 50·0	4·973	4·306	— ·310	— ·081	— ·074	8·89	8·90	
									3398·86	8·87	

* 3398″·89 used.

Pair 58. e (8·2) and i (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}720$; $\mu_s = +\ 0''{\cdot}071$.

		1890									
G	882	Aug 28	17 25·5	4650·290	1·971	— ·299	— ·070	— ·058	1·89	1·90	2–3 : 2–3
	1266	Nov. 11	23 10·7	49·209	2·604	— ·395	+ ·395	...	(½) 1·81	(½) [1·81]	3 : 3–4
									4651·86	1·87	
F	322	June 11	22 17·2	4649·727	1·798	+ ·234	— ·312	— ·270	4651·45	1·49	2 : 2–3
J	630	July 25	22 24·3	4651·180	1·925	— ·077	—1·936	—1·944	4651·09	1·08	1–2 : 2–3
C	42	July 6	18 14·7	4650·200	1·293	+ ·063	— ·101	— ·101	4651·56	1·46	
S	17	June 1	17 47·0	4650·062	1·308	+ ·293	— ·301	— ·302	4651·36	1·36	

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TABLE III.—*continued.*

Pair 59. e (8·2) and a (7·7) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}680$; $\mu_s = -\ 0''{\cdot}068$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	928	Aug. 31	21 1·7	4386·188	1·251	— ·305	— ·014	+ ·034	4387·12	7·17	1–2 : 2–3
F	289	June 6	16 32·3	4384·663	2·736	+ ·243	— ·045	— ·061	(½) 4387·60	(½) 7·58	2–3 : 3–4
J	629	July 25	22 17·4	4387·259	1·447	— ·081	—1·826	—1·788	4386·80	6·84	1–2 : 2–3
C	5	June 25	20 21·0	4384·936	1·953	+ ·127	+ ·150	+ ·150	7·17	7·17	
	428	Sept. 25	20 39·1	4·732	2·219	— ·393	+ ·136	— ·218	6·70	6·34	
									4386·94	6·76	
S	25	June 8	17 30·0	4385·217	1·365	+ ·231	— ·147	— ·231	4386·67	6·58	

Pair 60. d (8·4) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}075$; $\mu_s = +\ 0''{\cdot}058$.

G	162	1890 May 2	15 46·5	6933·053	7·051	+ ·623	— ·176	— ·344	0·55	0·38	2–3 : 2–3
	777	Aug. 17	17 1·4	7·702	3·766	— ·349	+ ·162	+ ·097	1·28	1·22	2 : 3
	898	„ 28	22 3·2	9·467	2·100	— ·446	— ·269	— ·462	0·85	0·66	2 : 2
									6940·89*	0·75	
F	323	June 11	22 30·4	6938·920	2·226	+ ·351	— ·465	— ·430	(½) 1·03	(½) 1·07	3 : 3
	1074	Oct. 8	21 11·3	9·724	1·965	— ·655	— ·116	— ·097	(½) 0·92	(½) 0·94	3 : 3
									6940·98	1·01	
J	545	July 19	22 20·4	6937·112	2·228	— ·048	+1·540	...	6940·83	[0·83]	2 : 2–3
C	35	July 5	19 17·0	6938·011	2·447	+ ·101	+ ·193	+ ·194	0·75	0·75	
	249	Aug. 23	20 55·8	8·187	3·804	— ·405	— ·086	+ ·226	1·50	1·82	
	373	Sept. 18	19 49·3	9·076	2·701	— ·583	+ ·322	+ ·323	1·52	1·52	
									6941·26	1·36	
S	29	June 8	18 43·0	6938·176	2·703	+ ·379	— ·232	— ·430	1·03	0·83	
	144	Oct. 9	21 1·5	6·995	5·240	— ·656	+ ·022	+ ·022	1·60	1·60	
									6941·32	1·22	

* 6940″·88 used.

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TABLE III.—*continued.*

Pair 61. d (8·4) and b (8·3) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}418$; $\mu_s = +\ 0''{\cdot}002$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	929	Aug. 31	21 7·0	2697·103	0·767	— ·187	— ·009	+ ·010	2697·67	7·69	1–2 : 2–3
F	321	June 11	22 2·5	2696·996	0·764	+ ·132	— ·181	— ·155	2697·71	7·74	2 : 2–3
J	633	July 25	22 58·8	2696·170	0·847	— ·049	+ ·091	+ ·025	2697·06	6·99	1·2 : 2·3
C	10	June 26	19 23·4	2696·257	1·115	+ ·076	+ ·109	+ ·109	7·56	7·56	
	437	Oct. 5	21 1·4	6·523	1·560	— ·140	— ·050	— ·096	7·89	7·84	
									2697·73	7·70	
S	40	June 25	18 34·0	2695·712	1·303	+ ·077	+ ·461	+ ·510	7·55	7·60	
	149	Oct. 11	21 14·5	4·988	2·793	— ·256	+ ·012	+ ·004	7·54	7·53	
									2697·55	7·57	

Pair 62. t (7·8) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}282$; $\mu_s = +\ 0''{\cdot}002$.

		1890									
G	843	Aug. 21	21 19·2	1821·105	0·729	— ·091	— ·010	+ ·028	1·73	1·77	1–2 : 2–3
	1010	Sept. 26	21 6·6	1·140	0·667	— ·159	— ·060	— ·039	(½) 1·59	(½) 1·61	3 : 3
									1821·68	1·72	
F	331	June 12	16 3·4	1821·504	0·848	+ ·100	— ·489	— ·502	1821·96	1·95	1–2 : 2
J	531	July 18	16 21·2	1820·329	0·740	+ ·003	+ ·438	+ ·386	1821·51	1·46	2 : 2
C	141	July 21	18 4·5	1820·499	0·939	— ·013	+ ·133	+ ·133	1·56	1·56	
	306	Aug. 31	21 4·7	1·375	0·507	— ·114	+ ·090	+ ·045	1·86	1·82	
									1821·71	1·69	
S	41	June 25	18 48·0	1820·403	0·880	+ ·067	+ ·311	+ ·347	1·66	1·70	
	150	Oct. 11	21 29·5	1·495	0·518	— ·171	+ ·008	+ ·008	1·85	1·85	
									1821·76	1·78	

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TABLE III.—*continued.*

Pair 63. t (7·8) and s (7·8) ; $\frac{\sigma}{\Sigma_0} = 0·441$; $\mu_s = -0''·026$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	"	"	"	"	"	"	"	
G	167	May 2	16 53·3	2848·359	1·616	+ ·261	— ·072	— ·110	50·16	50·13	2 : 2
	639	July 28	17 6·7	8·387	1·517	— ·043	+ ·082	+ ·084	49·94	49·95	1–2 : 3
	856	Aug. 25	17 36·8	8·715	1·340	— ·159	+ ·079	+ ·097	(½) 49·98	(½) 49·99	2–3 : 3–4
									2850·04	50·03	
F	292	June 6	17 42·4	2848·336	1·304	+ ·176	— ·030	— ·097	9·79	9·72	2 : 3
	907	Aug. 29	17 35·1	8·608	1·350	— ·174	— ·048	— ·088	(½) 9·74	(½) 9·70	3 : 3–4
									2849·77	49·72	
J	529	July 18	15 56·2	2846·355	2·468	+ ·002	+ ·685	+ ·695	2849·51	9·52	2–3 : 2
C	131	July 20	18 34·2	2848·481	1·433	— ·013	+ ·004	+ ·022	49·90	49·92	
	297	Aug. 30	20 52·4	9·090	1·826	— ·178	+ ·009	+ ·022	50·75	50·76	
	400	Sept. 20	20 52·3	8·113	1·864	— ·241	+ ·123	+ ·101	49·86	49·84	
									2850·17	50·17	
S	46	June 25	20 8·0	2846·978	2·463	+ ·103	+ ·486	+ ·486	2850·03	0·03	

Pair 64. θ (8·5) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0·531$; $\mu_s = +0''·019$.

		1890									
G	524	July 17	23 16·0	3426·646	2·472	+ ·028	+ ·013	— ·112	9·16	9·03	1–2 : 2–3
	1021	Sept. 27	21 6·8	8·273	1·108	— ·298	+ ·192	+ ·250	9·28	9·33	(2 : 2)
									3429·22	9·18	
F	333	June 12	16 30·9	3427·947	1·757	+ ·204	— ·920	— ·945	3428·99	8·96	1–2 : 2
J	535	July 18	17 1·6	3426·640	1·406	+ ·023	+ ·823	+ ·651	3428·89	8·72	2 : 2
C	219	Aug. 15	20 55·4	3427·969	0·939	— ·127	+ ·048	+ ·016	8·83	8·80	
	348	Sept. 5	21 24·6	7·740	0·964	— ·216	+ ·303	+ ·350	8·79	8·84	
									3428·81	8·82	
S	58	July 10	18 49·0	3427·713	1·468	+ ·066	— ·166	— ·260	9·08	8·99	
	165	Oct. 14	20 59·0	8·461	0·949	— ·326	— ·140	— ·170	8·94	8·91	
									3429·01	8·95	

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TABLE III.—*continued.*

Pair 65. θ (8·5) and ζ (8·1) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}694$; $\mu_s = +\ 0''{\cdot}028$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	784	Aug. 17	17 55·0	4480·601	2·051	— ·182	+ ·105	+ ·121	2·58	2·59	1–2 : 2–3
	1061	Oct. 7	21 58·3	1·244	1·376	— ·418	— ·108	— ·056	2·09	2·15	1–2 : 2
									4482·34	2·37	
F	334	June 12	16 43·2	4473·657	2·991	+ ·268	—1·202	—1·235	(4475·71)	(75·68)	Rejected.
J	530	July 18	16 9·2	4477·228	3·938	+ ·029	+1·076	+1·013	4482·27	2·21	2–3 : 2
C	228	Aug. 16	20 57·8	4480·032	3·006	— ·178	+ ·132	+ ·132	2·99	2·99	
	353	Sept. 7	19 16·8	0·260	2·307	— ·292	— ·028	+ ·215	2·25	2·50	
									4482·62	2·75	
S	59	July 10	19 5·5	4479·043	3·587	+ ·086	— ·217	— ·347	82·50	2·37	
	166	Oct. 14	21 15·5	8·527	5·081	— ·429	— ·183	— ·215	83·00	2·96	
									4482·75	2·67	

Pair 66. λ (7·3) and μ (6·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}071$; $\mu_s = -\ 0''{\cdot}011$.

		1889									
G	24	Sept. 3	22 55·0	6910·791	3·527	— ·432	+ ·131	+ ·032	4·02	3·92	2–3 : 3
		1890									
	168	May 2	17 14·7	1·334	2·229	+ ·658	— ·175	— ·171	4·05	4·05	2 : 2
	782	Aug. 17	17 39·0	1·656	2·261	— ·268	+ ·162	+ ·134	3·81	3·78	1–2 : 2–3
	1226	Oct. 30	23 9·9	1·048	3·737	— ·666	+ ·190	+ ·150	4·31	4·27	2 : 3
									6914·05	4·01	
F	335	June 12	16 54·7	6913·427	2·297	+ ·426	—1·855	—1·885	4·29	4·27	1–2 : 2
	957	Sept. 3	22 15·4	1·716	2·937	— ·431	— ·446	— ·418	(½) 3·78	(½) 3·80	3 : 3
									6914·12	4·11	
J	591	July 22	22 37·7	6910·274	3·321	+ ·016	+1·338	+1·082	6914·95*	4·69	1 : 2
C	165	July 31	20 41·6	6909·694	3·969	— ·101	— ·075	— ·471	3·48	3·09	
	359	Sept. 7	20 48·9	9·960	4·083	— ·469	— ·043	— ·214	3·53	3·36	
	411	„ 23	21 18·8	10·175	4·045	— ·583	+ ·193	+ ·193	3·83	3·83	
									6913·61	3·43	
S	61	July 10	19 58·5	6907·805	6·986	+ ·148	— ·334	— ·482	4·61	4·46	
	77	„ 13	20 18·5	8·454	6·790	+ ·116	— ·748	— ·546	4·61	4·81	
									6914·61	4·64	

* 6915″·19 used.

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TABLE III.—*continued.*

Pair 67. λ (7·3) and ζ (8·1) ; $\frac{\sigma}{\Sigma_0}$ = 0·868 ; μ_s = + 0″·011.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	″	″	″	″	″	″	″	
G	56	Sept. 8	21 39·9	5599·363	1·614	— ·390	+ ·978	...	(½) 1·57	(½) [1·57]	3 : 3
		1890									
G	566	July 20	23 11·9	598·530	2·122	+ ·022	— ·029	— ·139	0·65	0·54	2–3 : 2–3
	857	Aug. 25	17 45·9	599·207	2·592	— ·289	+ ·156	+ ·165	(½) 1·67	(½) 1·68	2–3 : 3 4
	1025	Sept. 29	21 37·4	600·068	1·596	— ·496	+ ·161	+ ·238	1·33	1·41	2–3 : 2–3
	1068	Oct. 7	22 57·0	599·532	1·977	— ·521	— ·134	— ·347	0·85	0·64	2–3 : 2–3
	1090	„ 9	22 42·8	599·792	1·842	— ·526	+ ·034	— ·087	1·14	1·02	2–3 : 2–3
									5601·12	1·05	
F	336	June 12	17 5·4	5599·160	3·424	+ ·338	—1·502	—1·519	1·42	1·40	1–2 : 2
	1075	Oct. 8	21 27·9	9·913	1·598	— ·524	— ·094	— ·200	(½) 0·89	(½) 0·79	3 : 3
	1098	„ 10	22 4·9	9·815	1·642	— ·528	+ ·346	+ ·412	(½) 1·28	(½) 1·34	3–4 : 3–4
									5601·25	1·22	
C	233	Aug. 18	20 14·0	5599·646	2·029	— ·241	+ ·226	+ ·226	1·67	1·67	
	355	Sept. 7	19 51·0	9·938	1·864	— ·380	— ·035	+ ·217	1·39	1·65	
									5601·53	1·66	
S	66	July 12	18 34·0	5600·065	1·713	+ ·094	— ·322	— ·234	1·55	1·64	
	168	Oct. 14	21 59·5	597·332	4·939	— ·535	— ·228	— ·104	1·51	1·63	
									5601·53	1·64	

Pair 68. *m* (5·0) and *o* (7·5) ; $\frac{\sigma}{\Sigma_0}$ = 0·536 ; μ_s = — 0″·015.

G	923	1890 Aug. 31	17 34·6	3455·414	1·655	— ·228	+ ·067	+ ·054	3456·91	6·90	1–2 : 2–3
F	337	June 12	17 17·6	3456·175	1·823	+ ·176	— ·927	— ·931	3457·25	7·24	1–2 : 2
J	635	July 25	23 15·5	3455·362	1·150	— ·048	+ ·116	+ ·112	3456·58	6·58	1–2 : 2–3
C	100	July 17	18 56·4	3456·083	1·192	— ·013	— ·054	— ·048	3457·21	7·21	
S	69	July 12	19 24·5	3455·330	1·737	+ ·022	— ·199	— ·257	3456·89	6·83	

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TABLE III.—*continued.*

Pair 69. m (5·0) and i (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}182$; $\mu_s = +\ 0''{\cdot}062$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	695	Aug. 8	22 18·3	1175·147	0·415	— ·042	— ·074	— ·106	5·45	5·41	1–2 : 2–3
	1109	Oct. 11	22 20·8	4·714	0·406	— ·110	+ ·015	+ ·020	(½) 5·03	(½) 5·03	3–4 : 3
									1175·37	5·33	
F	419	July 9	22 48·0	1174·740	0·486	+ ·012	— ·094	— ·095	1175·14	5·14	2 : 2–3
C	86	July 14	18 24·1	1174·549	0·330	·000	— ·004	...	1174·88	[4·88]	
S	93	July 26	18 41·0	1174·615	0·362	— ·019	— ·024	— ·016	1174·93	4·94	

Pair 70. μ (6·5) and κ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}676$; $\mu_s = -\ 0''{\cdot}028$.

		1889									
G	11	Sept. 3	17 47·9	4361·613	1·265	— ·276	+ ·484	+ ·480	3·09	3·08	2 : 3
	30	„ 6	18 3·2	1·548	1·243	— ·292	+ ·132	+ ·115	2·63	2·61	2 : 3
		1890									
G	564	July 20	22 51·0	0·776	2·572	+ ·021	— ·022	— ·108	3·35	3·26	2–3 : 2–3
	619	„ 25	16 28·9	1·186	1·566	— ·014	+ ·098	+ ·068	(½) 2·84	(½) 2·81	3 : 3
	697	Aug. 8	22 33·9	1·203	2·286	— ·112	— ·275	— ·433	3·10	2·94	2 : 2–3
	1224	Oct. 30	22 52·6	0·928	2·504	— ·422	+ ·120	+ ·074	3·13	3·08	2–3 : 3
									4363·04	2·98	
F	448	July 11	16 19·2	4361·033	1·621	+ ·084	+ ·067	+ ·142	2·81	2·88	2 : 2
	906	Aug. 29	17 25·8	1·662	1·314	— ·247	— ·074	— ·047	(½) 2·66	(½) 2·68	3 : 3–4
									4362·76	2·81	
J	534	July 18	16 53·7	4360·393	1·408	+ ·035	+1·048	+ ·838	4362·88	2·67	
C	164	July 31	20 26·3	4361·370	1·535	— ·063	— ·047	— ·257	2·80	2·59	
	358	Sept. 7	20 35·7	1·653	1·547	— ·292	— ·027	— ·047	2·88	2·86	
	410	„ 23	20 54·6	1·209	1·446	— ·368	+ ·122	+ ·122	2·41	2·41	
									4362·70	2·62	
S	62	July 10	20 35·0	4360·970	2·023	+ ·091	— ·211	— ·210	2·87	2·87	
	78	„ 13	20 46·5	1·758	1·932	+ ·071	— ·472	— ·399	3·29	3·36	
									4363·08	3·12	

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TABLE III.—*continued.*

Pair 71. z (8·5) and a (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}651$; $\mu_s = -\ 0''{\cdot}002$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	641	July 28	17 26·0	4200·775	1·657	— ·048	+ ·121	+ ·114	2·51	2·50	1–2 : 2
	642	„ 28	17 31·2	0·850	1·642	— ·048	+ ·121	+ ·114	2·57	2·56	1–2 : 2
	781	Aug. 17	17 32·1	0·933	1·661	— ·177	+ ·098	+ ·078	2·52	2·50	1–2 : 2–3
									4202·53	2·52	
F	422	July 9	23 27·3	4200·482	2·374	+ ·079	— ·335	— ·332	2·60	2·60	2 : 2–3 faint
	1198	Oct. 23	23 24·6	0·941	2·232	— ·403	— ·039	— ·254	(½) 2·73	(½) 2·52	3–4 : 3–4
									4202·63	2·58	
C	198	Aug. 6	21 44·9	4199·792	2·803	— ·101	+ ·059	+ ·020	2·55	2·51	
	338	Sept. 4	19 53·9	200·249	2·460	— ·279	+ ·208	+ ·163	2·64	2·59	
									4202·60	2·55	
S	79	July 13	21 32·0	4198·385	4·548	+ ·052	— ·454	— ·475	2·53	2·51	
	176	Nov. 16	21 25·5	8·458	4·630	— ·363	+ ·010	·000	2·74	2·73	
									4202·64	2·62	

Pair 72. z (8·5) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}728$; $\mu_s = +\ 0''{\cdot}049$.

		1890									
G	563	July 20	22 41·9	4696·711	3·051	+ ·003	— ·024	— ·109	9·74	9·66	2 : 2
	779	Aug. 17	17 19·1	8·307	1·455	— ·200	+ ·110	+ ·073	9·67	9·64	1–2 : 2–3
									4699·71	9·65	
F	483	July 14	16 15·6	4697·656	1·827	+ ·047	+ ·043	— ·051	9·57	9·48	2–3 : 2–3
	1193	Oct. 23	22 27·5	7·749	2·636	— ·448	— ·044	+ ·087	9·89	0·02	2 : 3
									4699·73	9·75	
C	176	Aug. 4	19 8·5	4697·551	1·876	— ·114	+ ·066	+ ·349	9·39	9·67	
	331	Sept. 3	21 33·5	8·489	1·319	— ·304	+ ·087	+ ·167	9·60	9·68	
									4699·50	9·68	
S	89	July 14	21 10·0	4698·339	1·486	+ ·048	— ·083	— ·087	9·79	9·79	
	178	Nov. 16	21 49·5	8·439	1·435	— ·402	+ ·011	— ·007	9·48	9·47	
									4699·64	9·63	

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TABLE III.—*continued.*

Pair 73. x (8·0) and a (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}914$; $\mu_s = -\ 0''{\cdot}051$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition I. S.
		1890	h m	″	″	″	″	″	″	″	
G	780	Aug. 17	17 25·8	5897·026	1·711	— ·252	+ ·138	+ ·101	8·62	8·59	1–2 : 2–3
	1040	Oct. 3	21 57·8	6·251	2·863	— ·538	+ ·188	...	8·76	[8·76]	2 : 2–3 faint
									5898·69	8·68	
F	445	July 11	15 46·8	5896·874	1·658	+ ·087	+ ·090	— ·018	5898·72	8·61	2 : 2
J	601	July 24	16 32·1	5896·761	1·699	— ·035	+ ·779	+ ·393	5899·20	8·82	2 : 3
C	182	Aug. 4	20 36·3	5896·803	2·523	— ·140	+ ·082	— ·009	9·27	9·18	
	336	Sept. 4	19 28·3	6·004	3·056	— ·393	+ ·292	+ ·174	8·96	8·84	
									5899·12	9·01	
An	213	Aug. 9	19 38·5	5895·008	4·264	— ·182	+ ·665	+ ·667	(5899·76)	(9·76)	Rejected.

Pair 74. x (8·0) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}294$; $\mu_s = +\ 0''{\cdot}046$.

		1890									
G	581	July 22	17 36·5	1895·443	0·605	— ·006	+ ·103	+ ·106	6·15	6·15	1 : 2–3
	848	Aug. 21	22 7·9	5·605	0·980	— ·092	— ·011	— ·022	6·48	6·47	1–2 : 2–3
									~~1896·32~~	~~6·31~~	
F	446	July 11	15 56·2	1895·443	0·592	+ ·027	+ ·029	+ ·015	6·09	6·08	2 : 2
	1119	Oct. 12	22 0·4	5·785	0·927	— ·179	+ ·120	+ ·032	(‡) 6·65	(‡) 6·57	3–4 : 3–4
									1896·20	6·18	
C	174	Aug. 4	18 41·6	1895·052	1·179	— ·051	+ ·026	+ ·076	6·21	6·26	
	339	Sept. 3	21 18·6	5·056	0·888	— ·114	+ ·035	+ ·076	5·87	5·91	
									1896·04	6·09	
An	221	Aug. 18	19 15·3	1894·575	1·555	— ·084	— ·058	— ·024	5·99	6·02	
	219	„ 17	20 34·0	4·495	1·356	— ·082	+ ·007	+ ·006	5·78	5·78	
									1895·89	5·90	

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TABLE III.—*continued.*

Pair 75. k (7·5) and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}812$; $\mu_s = -\ 0''{\cdot}047$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distances. I.	Resulting Distances. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	′ ″	″	
G	981	Sept. 10	22 5·2	5242·698	2·949	— ·404	+ ·084	+ ·089	(½) 5245·33	(½) 5·33	3–4 : 3–4
F	417	July 9	22 15·4	5242·250	3·246	+ ·056	— ·418	— ·426	5245·13	5·13	2 : 2–3
J	646	Aug. 2	16 53·6	5243·148	1·509	— ·142	+ ·628	+ ·633	5245·14	5·15	1–2 : 1–2
C	91	July 16	19 19·9	5242·864	2·510	+ ·013	+ ·081	+ ·114	5245·47	5·50	
An	226	Aug. 18	20 7·8	5242·566	3·110	— ·264	— ·161	— ·130	5245·25	5·28	

Pair 76. k (7·5) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}215$; $\mu_s = +\ 0''{\cdot}043$.

G	993	1890 Aug. 28	22 43·2	1384·762	0·804	— ·088	— ·054	— ·086	1385·42	5·39	2 : 2–3
F	418	July 9	22 33·9	1384·929	0·758	+ ·014	— ·110	— ·112	1385·59	5·59	2 : 2–3
J	647	Aug. 2	17 2·9	1384·930	0·595	— ·038	+ ·166	+ ·167	1385·65	5·65	1–2 : 1–2
C	74	July 11	20 7·5	1385·330	0·405	+ ·013	+ ·067	+ ·067	5·82	5·82	
	446	Oct. 8	21 40·9	4·979	0·608	— ·140	— ·015	— ·054	5·43	5·40	
									1385·63	5·61	
An	228	Aug. 18	20 33·8	1385·171	0·412	— ·070	— ·043	— ·047	1385·47	5·47	

Pair 77. y (8·2) and α (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}938$; $\mu_s = -\ 0''{\cdot}055$.

G	831	1890 Aug. 20	20 48·1	6050·367	2·257	— ·282	— ·040	— ·047	2·30	2·30	1 : 1–2
	1103	Oct. 11	21 15·9	0·480	2·320	— ·571	+ ·077	+ ·150	(½) 2·31	(½) 2·38	3 : 2–3
									6052·30	2·33	
F	421	July 9	23 16·5	6049·238	3·525	+ ·113	— ·483	— ·478	6052·39	2·40	2 : 2–3
C	191	Aug. 6	19 27·5	6048·749	3·602	— ·152	+ ·084	·000	6052·28	2·20	
An	234	Aug. 21	19 12·5	6047·321	5·812	— ·290	— ·159	— ·084	6052·68	2·76	

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TABLE III.—*continued.*

Pair 78. y (8·2) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}247$; $\mu_s = +\ 0''{\cdot}009$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	883	Aug. 28	17 34·9	1595·824	0·848	—·091	—·024	—·022	1596·56	6·56	2–3 : 2–3
F	420	July 9	23 3·4	1596·514	0·464	+·030	—·127	—·129	1596·88	6·88	2 : 2–3
J	636	July 25	23 22·5	1596·039	0·466	—·010	+·054	+·068	1596·55	6·56	1–2 : 2–3
C	192	Aug. 6	19 46·7	1595·841	0·672	—·038	+·022	·000	1596·50	6·48	
An	240	Aug. 21	20 34·8	1595·910	1·131	—·076	—·042	—·097	1596·92	6·87	

Pair 79. δ (8·2) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}998$; $\mu_s = -\ 0''{\cdot}011$.

		1890									
G	673	Aug. 6	16 55·6	6440·493	3·514	—·153	+·114	+·140	3·97	3·99	(2–3 : 2–3)
	1104	Oct. 11	21 25·8	1·531	2·189	—·605	+·082	+·160	(½) 3·20	(½) 3·28	3 : 2–3
									6443·71	3·75	
F	486	July 14	16 44·1	6439·960	3·727	+·082	+·059	+·030	6443·83	3·80	2–3 : 2–3
C	218	Aug. 15	20 40·5	6439·821	3·969	—·241	+·090	+·160	6443·64	3·71	
An	245	Aug. 22	20 41·8	6438·496	6·291	—·306	—·314	—·449	6444·17	4·03	

Pair 80. δ (8·2) and α (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}465$; $\mu_s = +\ 0''{\cdot}020$.

		1890									
G	674	Aug. 6	17 4·3	3004·508	1·387	—·075	+·053	+·079	5·87	5·90	(2–3 : 2–3)
	1026	Sept. 29	21 48·0	5·418	1·068	—·266	—·086	+·102	6·13	6·32	2–3 : 2–3
									3006·00	6·11	
F	485	July 14	16 33·8	3004·104	1·735	+·035	+·027	—·005	3005·90	5·87	2–3 : 2–3
J	593	July 22	22 51·9	3004·297	1·582	—·004	+·581	+·377	3006·46*	6·25	1 : 2
C	207	Aug. 7	20 5·9	3005·232	0·837	—·089	—·075	+·242	5·90	6·22	
	408	Sept. 23	20 31·4	5·003	0·850	—·254	+·084	+·084	5·68	5·68	
									3005·79	5·95	
An	248	Aug. 22	21 22·0	3005·481	0·969	—·146	—·146	—·256	3006·16	6·05	

* 3006″·56 used.

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TABLE III.—*continued.*

Pair 81. ε (6·3) and ι (7·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}693$; $\mu_s = +\ 0''{\cdot}022$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	620	July 25	16 43·4	4473·377	3·500	—·016	+ ·100	+·028	(½)4476·96	(½) 6·89	3 : 3
F	447	July 11	16 7·7	4471·748	5·101	+·083	+ ·069	+·087	7·00	7·02	2 : 2
	948	Sept. 1	22 40·2	5·665	1·441	—·268	— ·076	—·014	(½) 6·76	(½) 6·82	3 : 3–4
									4476·92	6·95	
J	592	July 22	22 45·1	4475·160	1·485	+·005	+ ·866	+·624	4477·52*	7·27	1 : 2
C	231	Aug. 18	19 16·9	4475·415	1·344	—·190	+ ·180	+·180	6·75	6·75	
	350	Sept. 5	21 59·9	3·741	2·752	—·279	+ ·395	+·243	6·62	6·46	
									4476·69	6·61	
An	249	Aug. 22	21 32·8	4474·026	2·983	—·208	— ·218	—·374	4476·58	6·43	

* 4477″·67 used.

Pair 82. ε (6·3) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}622$; $\mu_s = +\ 0''{\cdot}083$.

		1890									
G	808	Aug. 19	17 48·8	4013·878	1·138	—·174	+ ·140	+·075	4·98	4·92	1–2 : 2–3
	1108	Oct. 11	22 9·5	3·095	2·011	—·375	+ ·051	+·081	(½) 4·78	(½) 4·81	3–4 : 3
									4014·94	14·90	
F	484	July 14	16 24·4	4013·275	1·334	+·049	+ ·037	—·031	4014·70	4·63	2–3 : 2–3
C	213	Aug. 15	19 5·8	4013·240	1·813	—·152	+ ·056	+·249	4014·96	5·15	
An	252	Aug. 22	22 20	4014·274	1·280	—·191	— ·196	—·274	4015·17	5·09	

Pair 83. *g* (8·5) and *n* (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}986$; $\mu_s = -\ 0''{\cdot}011$.

		1890									
G	691	Aug. 8	21 15·8	6361·872	2·788	—·231	— ·401	—·246	4·03	4·18	1–2 : 2–3
	1106	Oct. 11	21 48·0	1·247	3·199	—·602	+ ·081	+·158	(½) 3·93	(½) 4·00	3–4 : 3
									6364·01	4·14	
F	478	July 14	15 27·6	6361·544	2·528	+·015	+ ·058	+·010	6364·15	4·10	2–3 : 2 3
C	68	July 11	18 6·4	6360·855	3·538	+·038	+ ·306	+·306	6364·74	4·74	
An	259	Aug. 30	19 57·0	6361·954	2·794	—·418	+ ·266	+·197	6364·70	4·63	

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TABLE III.—*continued.*

Pair 84. g (8·5) and l (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}661$; $\mu_s = -\ 0''{\cdot}021$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	″	″	
G	692	Aug. 8	21 26·4	4264·599	1·288	—·156	— ·269	— ·205	5·46	5·53	1-2 : 2-3
	1101	Oct. 11	20 55·0	4·670	1·282	—·402	+ ·054	+ ·086	(½) 5·60	(½) 5·64	3 : 2-3
									4265·51	5·57	
F	460	July 12	23 20·6	4264·283	1·205	+·022	— ·350	— ·397	4265·16*	5·11	2 : 2-3
C	64	July 9	20 12·1	4263·149	2·282	+·038	— ·053	— ·079	4265·42	5·39	
An	315	Sept. 13	23 10·0	4253·472	12·899	—·340	+ ·015	+ ·020	4266·05	6·05	

* 4265″·15 used.

Pair 85. E (8·0) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}756$; $\mu_s = -\ 0''{\cdot}023$.

		1890									
G	166	May 2	16 43·6	4913·025	2·520	+·440	— ·124	— ·212	5·86	5·77	2 : 2
	776	Aug. 17	16 50·5	3·715	2·486	—·241	+ ·114	+ ·076	6·07	6·04	2 : 3
	1083	Oct. 9	21 34·6	4·418	1·686	—·461	+ ·030	+ ·242	5·67	5·89	2 : 3
									4915·87	5·90	
F	481	July 14	15 53·9	4912·206	3·401	+·010	+ ·045	— ·057	5·66	5·56	2-3 : 2-3
	975	Sept. 9	21 28·7	4·607	1·676	—·374	— ·318	— ·341	5·59	5·57	2-3 : 2-3ft
									4915·63	5·57	
J	587	July 22	22 5·7	4912·989	1·754	—·052	+0·945	+1·067	4915·64*	5·76	1-2 : 1-2
C	82	July 13	20 38·3	4912·762	3·221	+·013	+ ·076	— ·447	6·08	5·55	
	260	Aug. 24	21 27·4	1·658	3·855	—·292	+ ·091	+ ·030	5·31	5·25	
	380	Sept. 18	21 9·4	2·128	3·513	—·418	+ ·227	+ ·227	5·45	5·45	
									4915·61	5·42	
An	263	Aug. 30	20 42·0	4911·058	5·051	—·322	+ ·204	+ ·242	4915·99	6·03	

* 4915″·81 used.

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TABLE III.—*continued.*

Pair 86. E (8·0) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}073$; $\mu_s = +\ 0''{\cdot}054$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	432	July 10	17 26·9	6887·568	1·978	+·047	+ ·163	+·097	(½) 89·76	(½) 89·69	3 : 2–3
	786	Aug. 17	20 37·3	8·136	2·554	—·352	— ·039	—·080	90·30	90·26	(2 : 2–3)
									6890·12	90·07	
F	480	July 14	15 44·6	6887·298	2·528	+·003	+ ·063	—·054	89·89	89·78	2–3 : 2–3
	1129	Oct. 14	20 51·0	8·089	2·649	—·658	+ ·036	+·134	(½) 90·12	(½) 90·21	3–4 : 3–4
									6889·94	89·87	
C	21	June 28	21 36·9	6888·389	1·915	+·178	+ ·171	+·172	90·65	90·65	
	244	Aug. 23	19 30·8	7·844	2·587	—·405	— ·086	+·086	89·94	90·12	
									6890·30	90·39	
An	272	Sept. 1	22 23·0	6888·489	2·039	—·480	— ·015	—·054	6890·03	89·99	

Pair 87. F (8·3) and z (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}775$; $\mu_s = 0''{\cdot}000$.

		1890									
G	433	July 10	17 38·7	5051·778	2·453	+·081	+ ·118	+·054	(½) 4·43	(½) 4·37	3 : 2–3
	1062	Oct. 7	22 6·9	3·173	1·454	—·466	— ·120	—·097	4·04	4·06	1–2 : 2
									5054·17	4·16	
F	459	July 12	23 6·4	5053·194	1·611	+·065	— ·411	—·457	5054·46*	4·41	2 : 2–3
J	544	July 19	22 8·2	5051·316	1·473	+·010	+1·111		5053·91	[3·91]	2 : 2–3
C	186	Aug. 6	17 51·1	5053·128	1·420	—·127	+ ·070	—·178	4·49	4·24	
	327	Sept. 3	20 37·5	2·090	2·345	—·330	+ ·093	+·155	4·20	4·27	
									5054·35	4·26	
An	276	Sept. 1	23 7·5	5044·017	10·966	—·315	— ·011	—·078	5054·66	4·59	

* 5054″·45 used.

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TABLE III.—*continued.*

Pair 88. F (8·3) and v (6·5) ; $\frac{\sigma}{\Sigma_0}$ = 0·812 ; μ_s = — 0″·003.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	580	July 22	17 28·3	5240·264	1·657	—·022	+·284	+·284	2·18	2·18	1 : 2-3
	839	Aug. 20	21 56·4	39·691	2·500	—·253	—·035	—·081	1·90	1·86	1-2 : 1-2
									5242·04	2·02	
F	489	July 14	17 17·5	5239·884	1·618	+·044	+·048	+·223	1·59	1·77	2-3 : 2-3
	1194	Oct. 23	22 42·6	9·805	3·125	—·500	—·049	+·020	(½) 2·38	(½) 2·45	3 : 3-4
									5241·85	2·00	
C	152	July 22	19 28·1	5239·249	2·955	—·025	—·041	—·041	2·14	2·14	
	317	Sept. 1	20 27·0	9·669	2·637	—·330	+·106	+·195	1·87	2·18	
									5242·01	2·16	
An	283	Sept. 2	20 3·5	5238·339	4·154	—·341	+·062	+·065	5242·21	2·22	

Pair 89. s (7·8) and v (6·5) ; $\frac{\sigma}{\Sigma_0}$ = 0·517 ; μ_s = + 0″·001.

		1890									
G	452	July 11	22 16·3	3335·469	0·992	+·041	+·085	+·088	6·59	6·59	1 : 2
	833	Aug. 20	21 5·3	5·630	0·935	—·163	—·022	—·031	6·38	6·37	1-2 : 1-2
									3336·49	6·48	
F	458	July 12	22 51·4	3335·371	1·048	+·035	—·274	—·297	6·18	6·16	2 : 2-3
	954	Sept. 3	21 30·8	5·673	0·916	—·223	—·216	—·233	(½) 6·15	(½) 6·13	2-3 : 3-4
									3336·17*	6·15	
C	134	July 20	19 31·2	3334·485	1·230	—·013	+·005	—·016	5·71	5·68	
	300	Aug. 31	19 8·9	5·599	1·141	—·216	+·165	+·212	6·60	6·64	3 : 3
									3336·16	6·16	
S	105	Sept. 8	20 45·0	3335·171	2·164	—·241	—·535	—·414	3336·56	6·68	

* 3336″·16 used.

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TABLE III.—*continued.*

Pair 90. s (7·8) and r (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}886$; $\mu_s = -\ 0''{\cdot}016$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	453	July 11	22 26·8	5715·871	2·859	+·065	+ ·146	+ ·133	8·94	8·93	1 : 2
	832	Aug. 20	20 57·2	6·780	2·239	—·284	— ·038	— ·044	8·70	8·69	1–2 : 1–2
									5718·82	8·81	
F	457	July 12	22 21·8	5716·118	2·762	+·056	— ·470	— ·487	8·47	8·45	2 : 2–3
	950	Sept. 3	17 32·8	6·992	2·079	—·385	— ·166	— ·248	(½) 8·52	(½) 8·44	3 : 3
									5718·49*	8·45	
C	124	July 19	19 50·4	5715·299	3·259	—·013	+ ·310	+ ·168	8·86	8·74	
	283	Aug. 28	19 58·2	5·995	3·195	—·342	+ ·151	+ ·151	9·00	9·00	
									5718·93	8·87	
S	107	Sept. 8	21 14·5	5714·226	5·363	—·417	— ·916	— ·921	5718·26	8·25	

* 5718″·47 used.

Pair 91. γ (7·8) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}051$; $\mu_s = +\ 0''{\cdot}039$.

		1890									
G	818	Aug. 19	21 45·7	6784·149	2·238	—·304	— ·048	— ·105	6·04	5·98	(2 : 3)
	1023	Sept. 29	21 16·6	4·446	2·053	—·599	+ ·195	+ ·431	6·10	6·33	2–3 : 2–3
									6786·07	6·16	
F	488	July 14	17 7·8	6782·609	3·428	+·073	+ ·062	+ ·221	6786·17	6·33	2–3 : 2–3
J	497	July 16	23 33·6	6779·912	4·699	+·052	+2·196	+2·076	6786·86	6·74	2 : 2
C	179	Aug. 4	19 54·6	6784·125	1·889	—·152	+ ·095	+ ·452	5·97	6·32	
	332	Sept. 3	21 46·0	3·174	2·930	—·443	+ ·126	+ ·231	5·79	5·89	
									6785·88	6·11	
An	295	Sept. 10	20 25·3	6784·556	2·102	—·490	+ ·008	+ ·001	6786·18	6·17	

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TABLE III.—*continued.*

Pair 92. *n* (6·8) and *h* (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}956$; $\mu_s = -\ 0''{\cdot}011$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	454	July 11	22 36·9	6166·248	4·555	+·045	+ ·158	+ ·143	6171·01	0·99	1 : 2
F	479	July 14	15 34·6	6168·267	1·966	+·015	+ ·056	— ·019	6170·30	0·23	2–3 : 2–3
J	493	July 16	22 37·6	6164·388	4·615	—·004	+1·996	+1·530	6171·00	0·53	1 : 2
C	77	July 13	18 56·9	6167·874	2·930	+·025	+ ·096	+ ·115	6170·93	0·95	
An	302	Sept. 10	22 24·0	6168·864	2·308	—·476	+ ·008	+ ·010	6170·70	0·71	

Pair 93. *a* (7·7) and *c* (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}583$; $\mu_s = -\ 0''{\cdot}009$.

		1890									
G	720	Aug. 13	16 32·3	3760·821	2·417	—·176	— ·013	— ·064	3·05	3·00	2 : 2
	1063	Oct. 7	22 15·1	2·121	1·074	—·354	— ·090	— ·099	2·75	2·74	1–2 : 2
									3762·90	2·87	
F	609	July 24	22 13·6	3762·086	1·089	—·064	— ·244	— ·146	3762·87	2·97	1–2 : 3
J	436	July 10	22 9·1	3760·908	1·082	+·019	+ ·743	+ ·880	3762·75	2·89	3 : 3
C	3	June 25	19 20·2	3761·127	1·687	+·101	+ ·128	+ ·128	3·05	3·05	
	236	Aug. 18	21 15·0	1·494	2·828	—·203	+ ·152	+ ·152	(½) 4·27	(½) 4·27	3–4 : 3–4
	425	Sept. 25	19 59·3	0·722	2·003	—·342	+ ·117	+ ·245	2·50	2·63	
									3763·07	3·15	
An	308	Sept. 13	20 39·0	3760·104	3·430	—·308	+ ·013	+ ·105	3763·24	3·33	

Pair 94. *v* (6·5) and *u* (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}192$; $\mu_s = +\ 0''{\cdot}029$.

		1890									
G	723	Aug. 13	16 55·0	1237·388	0·403	—·048	— ·004	— ·012	7·74	7·73	2 : 2
	1011	Sept. 26	21 17·2	7·165	0·488	—·108	— ·041	— ·027	7·50	7·52	3 : 3
									1237·62	7·63	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	614	July 24	23 21·1	1236·573	1·246	—·010	—·080	—·110	1237·73	7·70	1–2 : 3
J	533	July 18	16 42·4	1236·731	0·411	+·002	+·298	+·244	1237·44	7·39	2 : 2
C	147	July 22	17 59·4	1237·118	0·710	·000	—·010	—·010	7·82	7·82	
	312	Sept. 1	19 17·5	6·978	0·481	—·076	+·025	+·056	7·41	7·44	
									1237·62	7·63	
An	309	Sept. 13	20 51·5	1237·215	0·420	—·096	+·004	+·036	1237·54	7·58	

Pair 95. f (7·6) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}565$; $\mu_s = +\ 0''{\cdot}099$.

		1889									
G	78	Sept. 11	22 32·2	3650·012	1·811	—·288	+·160	+·096	(½) 1·70	(½) 1·63	3 : 3
		1890									
	283	June 5	15 36·3	48·119	3·486	+·215	—·059	—·057	1·76	1·76	2 : 3
	308	„ 10	22 22·5	50·169	1·691	+·191	—·040		2·01	[2·01]	
	640	July 28	17 17·0	50·482	1·484	—·075	+·105	+·102	2·00	1·99	1–2 : 3
	867	Aug. 25	21 57·9	50·932	1·451	—·220	—·059	—·023	2·10	2·14	2 : 2–3
									3651·94	1·94	
F	502	July 17	15 37·7	3648·799	3·496	—·011	+·007	—·057	2·29	2·23	1–2 : 1–2
	940	Sept. 1	18 8·9	51·263	1·184	—·250	+·259	+·350	2·46	2·55	2·3 : 2–3
	955	„ 3	21 45·6	50·874	1·328	—·258	—·236	—·249	1·71	1·70	2 : 3
	962	„ 5	21 29·5	51·017	1·278	—·266	—·254	—·158	1·78	1·87	1–2 : 2
									3652·06	2·09	
J	437	July 10	22 22·6	3649·332	1·722	+·029	+·720	+·836	1·80	1·92	3 : 3
	598	„ 24	16 9·1	9·389	2·482	—·052	+·482	+·509	2·30	2·33	2 : 3
									3652·05	2·13	
C	55	July 8	19 35·7	3650·903	0·989	+·038	—·085	—·085	1·84	1·84	
	258	Aug. 24	20 49·0	0·624	1·268	—·216	+·068	+·125	1·75	1·81	
	378	Sept. 18	20 45·7	1·055	1·230	—·304	+·170	+·170	2·15	2·15	
									3651·91	1·93	
S	4	May 19	17 40·5	3651·213	1·185	+·283	—·565	—·577	3652·12	2·10	

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TABLE III.—*continued.*

Pair 96. f (7·6) and l (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}856$; $\mu_s = +\ 0''{\cdot}007$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	″	″	″	″	″	″	″	
G	42	Sept. 6	22 37·7	5524·013	1·591	—·407	+ ·316	+ ·308	5·51	5·51	2 : 3
		1890									
	881	Aug. 28	17 17·5	3·629	2·867	—·351	— ·083	— ·064	6·06	6·08	2–3 : 2–3
									5525·79	5·80	
F	504	July 17	15 56·8	5521·028	5·142	—·017	+ ·011	— ·086	5526·16	6·07	1-2 : 1–2
J	438	July 10	22 36·4	5522·514	1·613	+·044	+1·091	+1·241	(5525·26)	(5·41)	Rejected.
C	53	July 8	18 59·1	5523·827	2·320	+·063	— ·128	— ·128	5526·08	6·08	
An	184	May 22	17 13·5	5523·025	3·135	+·410	+ ·051	— ·188	5526·62	6·38	

Pair 97. p (7·7) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}092$; $\mu_s = -\ 0''{\cdot}014$.

G	679	1890 Aug. 8	16 13·3	7052·369	4·107	—·232	+ ·286	+ ·175	7056·53	6·42	2 : 2–3
F	916	Aug. 29	21 51·9	7053·989	2·967	—·435	— ·524	— ·568	7056·00	5·95	2 : 3 ft.
J	441	July 10	23 26·6	7047·852	6·634	+·087	+1·391	+1·420	(½) 7055·96	(½) 5·99	3 : 3
An	195	May 23	17 20·0	7052·261	4·022	+·538	— ·334	— ·710	7056·49	6·11	

Pair 98. p (7·7) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}204$; $\mu_s = -\ 0''{\cdot}021$.

G	451	1890 July 11	22 2·2	1316·564	0·755	+·012	+ ·034	+ ·037	7·37	7·37	1 : 2
	680	Aug. 8	16 23·4	6·830	0·380	—·045	+ ·053	+ ·029	7·22	7·19	2 : 2–3
									1317·30	7·28	
F	905	Aug. 29	17 16·3	1317·006	0·372	—·082	— ·022	+ ·010	1317·27	7·31	3 : 3–4
J	474	July 13	22 43·1	1315·730	1·000	+·008	+ ·341	+ ·357	1317·08	7·10	2 : 2

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I.	Definition. S.
		1890	h m	″	″	″	″	″	″	″		
C	109	July 18	18 59·5	1316·793	0·621	·000	+ ·018	+ ·031	7·44	7·45		
	275	Aug. 27	21 23·0	6·882	0·418	—·076	— ·031	+ ·082	7·20	7·31		
									1317·32	7·38		
S	115	Sept. 17	21 16·0	1317·025	0·576	—·107	— ·161	— ·163	1317·33	7·33		
An	198	May 23	17 58·0	1316·172	1·184	+·099	— ·083	— ·082	1317·37	7·37		

Pair 99. q (8·3) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}777$; $\mu_s = +\ 0''{\cdot}014$.

		1890										
G	113	Apr. 17	17 21·6	5011·604	1·802	+·478	— ·062	— ·132	(½) 3·82	(½) 3·75	3 : 2–3	
	229	May 22	17 26·0	1·765	1·800	+·390	— ·192	— ·253	3·76	3·70	(2–3 : 2–3)	
	625	July 25	17 31·8	2·052	1·800	—·053	+ ·113	+ ·023	(½) 3·91	(½) 3·82	3 : 3	
	899	Aug. 28	22 10·9	1·981	2·320	—·301	— ·194	— ·350	3·81	3·65	2 : 2	
	1056	Oct. 7	21 10·5	2·424	1·732	—·468	— ·120	+ ·124	3·57	3·81	1–2 : 2	
									5013·75*	3·74		
F	553	July 20	16 33·9	5011·489	2·522	—·013	— ·116	— ·085	3·88	3·91	2 : 3	
	573	„ 21	22 18·8	1·955	2·457	—·021	— ·209	— ·148	4·18	4·24	2 : 3	
	1115	Oct. 12	21 17·5	2·857	1·746	—·474	+ ·318	— ·117	(½) 4·45	(½) 4·01	3 : 3–4	
	1165	„ 18	22 4·6	2·496	2·184	—·478	— ·120	— ·109	4·08	4·09	2–3 : 3	
									5014·10	4·07		
J	237	May 24	16 29·6	5009·741	2·595	+·381	+1·082	+1·088	5013·80	3·81	1–2 : 2	
C	123	July 19	19 30·9	5012·359	1·446	·000	+ ·272	+ ·287	4·08	4·10		
	292	Aug. 30	19 36·7	2·562	1·408	—·317	+ ·155	+ ·179	3·81	3·83	2–3 : 2–3	
	365	Sept. 8	19 40·5	4·008	1·408	—·368	+ ·451	+ ·451	(5·50)	(5·50)	3–4 : 3–4 Rejected	
	396	„ 20	20 11·4	4·400	1·408	—·418	+ ·218	+ ·311	(5·61)	(5·70)	3 : 3	
	417	„ 24	20 37·8	2·676	1·458	—·443	+ ·342	+ ·326	4·03	4·02	2 : 2	
									5013·97	3·98		
S	124	Sept. 18	20 37·5	5013·756	1·366	—·412	— ·691	— ·754	5014·02	3·96		
An	208	May 24	18 3·5	5010·803	2·120	+·381	+ ·246	+ ·295	5013·55	3·60		

* 5013″·74 used.

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TABLE III.—*continued.*

Pair 100. q (8·3) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}042$; $\mu_s = -\ 0''{\cdot}097$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	′	″	″	″	″	″	″	
G	68	Sept. 10	22 2·1	6729·203	2·714	—·514	+ ·625		(½) 2·03	(½) [2·03]	3 : 3
		1890									
	230	May 22	17 37·4	8·625	2·480	+·511	— ·257	— ·375	1·36	1·24	
	624	July 25	17 21·4	8·781	2·757	—·089	+ ·151	+ ·021	(½) 1·60	(½) 1·47	3 : 3
	868	Aug. 25	22 8·5	9·565	2·808	—·391	— ·107	— ·031	1·88	1·95	2 : 2–3
	1057	Oct. 7	21 21·3	9·634	2·276	—·629	— ·161	+ ·115	1·12	1·40	1–2 : 2
									6731·54	1·59	
F	552	July 20	16 22·9	6727·902	4·138	—·036	— ·155	— ·130	1·85	1·87	2 : 3
	572	„ 21	22 8·6	28·810	2·841	—·046	— ·280	— ·130	1·33	1·48	2 : 3
	1114	Oct. 12	21 7·6	30·344	2·135	—·637	+ ·427	— ·078	(½) 2·27	(½) 1·76	3 : 3–4
	1190	„ 23	21 54·6	29·644	2·550	—·636	— ·062	+ ·167	1·50	1·73	2–3 : 3
									6731·66	1·70	
J	494	July 16	22 55·3	6725·482	4·041	+·007	+2·177	+1·771	6731·71	1·30	1 : 2
C	103	July 17	20 14·3	6730·648	1·927	—·013	— ·104	— ·156	2·47	2·41	
	269	Aug. 27	19 53·6	29·723	1·864	—·405	— ·156	— ·229	1·02	0·95	
	364	Sept. 8	19 16·1	30·230	1·864	—·494	+ ·603	+ ·604	2·20	2·20	
	384	„ 19	19 55·5	30·928	1·902	—·558	+ ·541	+ ·542	(2·81)	(2·81)	Rejected.
	415	„ 24	20 15·8	29·242	2·042	—·596	+ ·458	+ ·386	1·79	1·72	
									6731·87	1·82	
S	15	June 1	17 5·0	6728·317	3·025	+·440	— ·436	— ·438	1·35	1·34	
	137	Oct. 8	21 29·0	9·957	2·845	—·631	— ·054	— ·052	2·12	2·12	
									6731·74	1·73	

Pair 101. e (8·2) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}853$; $\mu_s = +\ 0''{\cdot}099$.

		1890									
G	558	July 20	21 43·6	5502·212	1·633	—·046	— ·028	+ ·026	3·77	3·83	2 : 2
	686	Aug. 8	17 32·4	2·249	2·514	—·206	+ ·223	+ ·192	4·78	4·75	1 : 2–3
									5504·28	4·29	
F	915	Aug. 29	21 40·5	5503·422	1·611	—·359	— ·409	— ·375	5504·27	4·30	2 : 3 faint
C	43	July 6	18 33·8	5502·547	1·700	+·076	— ·120	— ·119	4·20	4·20	
	253	Aug. 24	19 26·8	2·446	2·003	—·330	+ ·102	+ ·256	4·22	4·38	
									5504·21	4·29	
S	38	June 25	18 6·0	5500·800	1·865	+·168	+ ·941	+1·007	5503·77	3·84	

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TABLE III.—*continued.*

Pair 102. *e* (8·2) and *b* (8·3) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}690$; $\mu_s = -\ 0''{\cdot}076$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	687	Aug. 8	17 41·0	4449·962	1·972	—·176	+ ·181	+ ·179	4451·94	1·94	1 : 2–3
F	964	Sept. 5	21 55·4	4450·841	1·315	—·332	— ·310	— ·283	4451·51	1·54	1–2 : 2
J	369	June 16	22 46·7	4448·963	1·285	+·187	+1·271	+1·263	4451·71	1·70	
C	13	June 27	19 26·4	4449·686	2·257	+·114	— ·076	— ·262	1·98	1·80	
	438	Oct. 5	21 25·2	8·810	3·437	—·431	— ·083	— ·124	1·74	1·70	
									4451·86	1·75	
S	26	June 8	17 42·0	4448·722	2·988	+·236	— ·149	— ·269	4451·80	1·68	

Pair 103. *d* (8·4) and *i* (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}896$; $\mu_s = +\ 0''{\cdot}009$.

G	931	1890 Aug. 31	21 20·4	5784·067	1·650	—·395	—·019	—·054	5785·30	5·27	1–2 : 2–3
F	505	July 17	16 5·7	5780·706	4·960	—·024	+·012	—·090	5785·65	5·55	1–2 : 1–2
J	368	June 16	22 20·7	5781·423	1·788	+·251	+1·652	+1·604	5785·11	5·07	
C	31	June 30	21 20·2	5781·139	3·715	+·127	—·636	—·824	(5784·34)	(4·16)	Rejected.
S	30	June 8	18 59·5	5782·640	2·509	+·314	—·194	—·323	5785·27	5·14	

Pair 104. *t* (7·8) and *x* (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}800$; $\mu_s = +\ 0''{\cdot}044$.

G	722	1890 Aug. 13	16 46·2	5160·870	1·901	—·198	—·018	—·072	2·56	2·50	2 : 2
	1024	Sept. 29	21 28·3	0·776	2·064	—·461	+·149	+·264	2·53	2·64	2–3 : 2–3
									5162·55	2·57	
F	506	July 17	16 13·2	5160·040	2·327	+·019	+·010	—·064	5162·40	2·32	1–2 : 1–2

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
J	373	June 16	23 38·6	5155·484	5·906	+·259	+1·473	+1·584	5163·12	3·23	
C	144	July 21	18 52·4	5160·233	2·080	—·025	+·376	+·376	2·67	2·67	
	311	Sept. 1	19 3·0	0·677	1·965	—·330	+·104	+·176	2·42	2·50	
									5162·55	2·59	
S	43	June 25	19 23·5	5159·164	2·094	+·193	+·882	+·952	2·33	2·40	
	151	Oct. 11	21 46·0	61·552	1·441	—·486	+·022	+·040	2·53	2·55	
									5162·43	2·48	

Pair 105. λ (7·3) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}050$; $\mu_s = +\ 0''{\cdot}021$.

		1889									
G	74	Sept. 11	21 47·1	6773·887	2·695	—·492	+ ·298	+ ·368	(½) 6·39	(½) 6·46	3 : 3
		1890									
	693	Aug. 8	21 37·8	4·433	2·626	—·178	— ·427	— ·410	6·45	6·47	1–2 : 2–3
	1028	Sept. 29	22 8·4	4·080	2·978	—·598	+ ·195	+ ·105	6·66	6·57	2–3 : 2–3
	1067	Oct. 7	22 48·6	3·427	3·944	—·628	— ·163	— ·368	6·58	6·38	2–3 : 2–3
	1087	„ 9	22 11·8	3·894	3·048	—·634	+ ·041	+ ·158	6·35	6·47	2–3 : 2–3
									6776·50	6·47	
F	515	July 17	17 33·8	6773·864	2·285	+·059	+ ·014	+ ·252	6·22	6·46	1 : 2
	1073	Oct. 8	20 59·6	4·993	2·247	—·631	— ·113	+ ·011	(½) 6·50	(½) 6·62	3 : 3
	1120	„ 12	22 15·8	4·512	3·113	—·641	+ ·431	+ ·315	(¼) 7·42	(¼) 7·30	3-4 : 3-4
									6776·47	6·63	
J	370	June 16	23 1·2	6769·958	4·310	+·373	+1·935	+1·964	6776·58	6·61	
C	224	Aug. 16	19 48·7	6774·741	2·257	—·254	+ ·200	+ ·200	6·95	6·95	
	349	Sept. 5	21 39·4	5·072	1·864	—·431	+ ·599	+ ·567	7·11	7·08	
									6777·03	7·02	
S	65	July 12	18 21·5	6772·151	4·301	+·113	— ·390	— ·221	6·18	6·34	
	169	Oct. 14	22 16·0	5·056	1·883	—·645	— ·276	— ·284	6·02	6·01	
									6776·10	6·18	

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TABLE III.—*continued.*

Pair 106. m (5·0) and l (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}658$; $\mu_s = +\ 0''{\cdot}054$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	′	″	
G	696	Aug. 8	22 26·1	4246·083	2·177	—·153	— ·268	— ·401	4247·84	7·71	2 : 2–3
F	973	Sept. 9	21 9·7	4246·834	1·722	—·322	— ·276	— ·263	4247·96	7·97	2–3 : 2–3 ft.
J	352	June 15	22 23·2	4244·689	2·103	+·196	+1·294	+1·178	(½)4248·28	(½) 8·17	2 : 3–4
C	95	July 16	20 38·2	4245·875	2·358	+·013	+ ·066	+ ·211	4248·32	8·46	
S	70	July 12	19 40·0	4244·756	3·665	+·024	— ·244	— ·362	4248·20	8·08	

Pair 107. z (8·5) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}834$; $\mu_s = +\ 0''{\cdot}052$.

G	565	1890 July 20	23 2·4	5379·572	3·853	+·011	— ·027	— ·133	3·41	3·30	2–3 : 2–3
	724	Aug. 13	17 3·1	81·686	1·553	—·192	— ·018	— ·033	3·03	3·01	2 : 2
									5383·22	3·16	
F	978	Sept. 9	22 1·3	5381·831	2·587	—·383	— ·350	— ·434	5383·69	3·60	2–3 : 2–3ft.
J	498	July 16	23 46·6	5375·910	5·866	+·045	+1·741	+1·735	5383·56	3·56	2 : 2
C	203	Aug. 7	18 45·9	5380·593	3·284	—·152	— ·133	— ·117	5383·60	3·61	

Pair 108. z (8·5) and γ (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}629$; $\mu_s = -\ 0''{\cdot}021$.

G	890	1890 Aug. 28	18 37·5	4063·069	1·652	—·229	— ·061	— ·094	4064·43	4·40	2–3 : 2–3
F	1034	Oct. 2	21 0·1	4063·650	1·228	—·365	+ ·063	+ ·076	4064·58	4·59	1–2 : 1–2
J	439	July 10	22 54·3	4062·404	1·170	+·073	+ ·802	+ ·882	4064·45	4·53	3 : 3
C	202	Aug. 7	18 32·7	4063·901	1·509	—·114	— ·101	— ·170	4065·20	5·13	
S	84	July 14	19 43·0	4062·201	2·504	+·047	— ·072	— ·076	4064·68	4·68	

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TABLE III.—*continued.*

Pair 109. x (8·0) and γ (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}998$; $\mu_s = -\ 0''{\cdot}062$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	″	″	
G	884	Aug. 28	17 41·3	6441·584	3·041	—·367	— ·097	— ·090	6444·16	4·17	2–3 : 2–3
F	1036	Oct. 2	21 19·5	6442·609	1·837	—·581	+ ·100	+ ·090	6443·97	3·96	1–2 : 1–2
J	442	July 10	23 55·9	6438·580	3·740	+·111	+1·271	+1·148	(½) 3·70	(½) 3·58	3 : 3
	496	„ 16	23 17·4	9·019	2·731	+·050	+2·085	+1·822	3·89	3·62	2 : 2
									6443·83	3·61	
C	188	Aug. 6	18 17·4	6442·407	1·750	—·165	+ ·090	— ·120	6444·08	3·57	
An	215	Aug. 9	20 2·0	6441·349	2·488	—·194	+ ·727	+ ·729	6444·37	4·37	

Pair 110. k (7·5) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}574$; $\mu_s = +\ 0''{\cdot}021$.

G	799	1890 Aug. 19	16 29·4	3705·574	2·384	—·190	+ ·129	+ ·144	(½) 7·90	(½) 7·91	2–3 : 3–4
	887	„ 28	18 7·2	6·482	1·328	—·232	— ·050	— ·069	7·52	7·51	2–3 : 2–3
									3707·65	7·64	
F	908	Aug. 29	17 44·5	3706·144	1·459	—·237	— ·063	— ·178	(½) 3707·30	(½) 7·19	3 : 3–4
J	491	July 16	21 45·3	3705·158	1·264	—·001	+1·199	+ ·818	3707·62	7·24	1 : 2
C	92	July 16	19 41·3	3706·192	1·090	+·013	+ ·057	+ ·109	3707·36	7·41	
S	121	Sept. 18	19 54·5	3707·235	1·224	—·310	— ·511	— ·511	3707·64	7·64	
An	312	Sept. 13	22 10·8	3704·907	3·039	—·295	+ ·013	+ ·115	3707·66	7·77	

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TABLE III.—*continued.*

Pair 111. y (8·2) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 1·114$; $\mu_s = -0''·089$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	′	′	
G	725	Aug. 13	17 9·7	7191·199	2·138	—·256	— ·025	— ·011	7193·06	3·07	2 : 2
F	943	Sept. 1	21 28·2	7191·073	3·066	—·444	— ·123	— ·156	7193·59	3·54	2 : 2–3
J	536	July 18	17 9·0	7189·130	2·092	+·037	+1·722	+1·359	7192·98	2·62	1–2 : 2

Pair 112. y (8·2) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0·556$; $\mu_s = +0''·086$.

G	733	1890 Aug. 13	21 32·4	3593·088	1·320	—·131	— ·173	— ·211	3594·10	4·07	1–2 : 2
F	910	Aug. 29	18 5·2	3593·309	1·163	—·210	— ·061	— ·317	3594·20	3·95	2 : 3
J	371	June 16	23 13·3	3590·992	2·553	+·185	+1·025	+1·056	3594·76	4·74	
C	175	Aug. 4	18 56·4	3593·179	1·115	—·076	+ ·050	+ ·206	3594·27	4·43	
An	242	Aug. 22	19 57·5	3593·714	1·006	—·177	— ·175	— ·139	3594·37	4·40	

Pair 113. Same as 161.

Pair 114. (No pair set down for this.)

Pair 115. g (8·5) and i (7·8) ; $\frac{\sigma}{\Sigma_0} = 0·339$; $\mu_s = -0''·005$.

G	999	1890 Sept. 21	21 30·7	2189·989	1·035	—·188	+ ·078	+ ·059	2190·91	0·90	2 : 2–3
F	509	July 17	16 37·1	2190·004	0·700	—·006	+ ·004	— ·010	2190·70	0·69	1–2 : 1–2
J	354	June 15	23 9·0	2187·449	2·203	+·099	+ ·667	+ ·715	2190·42	0·47	2 : 3–4
C	62	July 9	19 30·5	2189·989	0·799	+·025	— ·027	— ·027	2190·78	0·78	
An	260	Aug. 30	20 10·0	2189·830	0·856	—·143	+ ·092	+ ·081	2190·64	0·62	

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TABLE III.—*continued.*

Pair 116. E (8·0) and i (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}665$; $\mu_s = 0''{\cdot}000$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	1000	Sept. 21	21 39·1	4312·665	1·707	− ·372	+ ·153	+ ·100	4314·15	4·10	2 : 2
F	510	July 17	16 46·7	4312·073	1·941	− ·013	+ ·009	·000	4314·01	4·00	1 : 2
J	353	June 15	22 46·6	4310·387	1·990	+ ·197	+1·308	+1·303	4313·88	3·88	2 : 3–4
C	79	July 13	19 43·3	4311·880	2·587	+ ·013	+ ·067	− ·133	4314·55	4·35	
An	265	Aug. 30	21 0·8	4310·150	4·555	− ·285	+ ·180	+ ·246	4314·60	4·67	

Pair 117. F (8·3) and x (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}545$; $\mu_s = +\ 0''{\cdot}023$.

G	886	1890 Aug. 28	17 55·6	3543·752	1·498	− ·205	− ·053	− ·054	3545·00	5·00	2–3 : 2–3
F	511	July 17	16 55·0	3543·371	1·888	+ ·016	+ ·007	+ ·014	5·28	5·29	1 : 2
	763	Aug. 15	21 55·6	4·167	1·228	− ·142	− ·276	− ·278	(½) 4·98	(½) 4·98	3 : 3
									3545·18	5·19	
J	343	June 12	22 45·5	3542·758	1·299	+ ·198	+ ·748		3545·00	[5·00]	2 : 2
C	169	Aug. 3	18 44·8	3543·875	1·965	− ·076	− ·251	− ·343	5·52	5·43	
	326	Sept. 3	20 24·0	3·583	2·169	− ·228	+ ·065	+ ·087	5·59	5·61	
									3545·56	5·52	
An	280	Sept. 2	19 19·8	3542·989	3·169	− ·226	+ ·041	+ ·044	3545·97	5·98	

Pair 118. s (7·8) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}466$; $\mu_s = -\ 0''{\cdot}026$.

G	730	1890 Aug. 13	21 7·8	3009·495	0·941	− ·118	− ·145	− ·135	0·17	0·18	1–2 : 2
	1029	Sept. 29	22 16·7	10·092	0·871	− ·268	+ ·087	+ ·023	0·78	0·73	2–3 : 2–3
									3010·48	10·46	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	503	July 17	15 45·0	3007·056	3·502	+ ·008	+ ·006	— ·047	3010·57	0·52	1–2 : 1–2
J	342	June 12	22 32·0	3008·938	0·884	+ ·164	+ ·640		3010·63	[0·63]	2 : 2
C	133	July 20	19 14·0	3009·087	1·395	— ·013	+ ·005	— ·005	10·48	0·47	
	299	Aug. 31	18 54·5	9·315	1·331	— ·190	+ ·149	+ ·219	10·61	0·68	
									3010·55	0·58	
S	106	Sept. 8	20 57·0	3008·370	2·830	— ·217	— ·482	— ·419	3010·50	0·56	

Pair 119. r (7·8) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 0·799$; $\mu_s = 0''·000$.

		1890									
G	541	July 19	16 27·1	5152·403	1·497	— ·003	+ ·434		4·33	[4·33]	(2 : 2–3)
	1039	Oct. 3	21 47·9	1·555	2·563	— ·471	+ ·164		3·81	[3·81]	2 : 2–3 faint.
									5154·07	4·07	
F	512	July 17	17 4·2	5152·097	1·495	+ ·013	+ ·010	+ ·048	5153·62	3·65	1 : 2
J	341	June 12	22 20·8	5150·653	3·153	+ ·281	+1·096		5155·18	[5·18]	2 : 2
C	129	July 20	18 0·2	5150·773	3·487	— ·013	+ ·008	+ ·080	4·26	4·33	
	294	Aug. 30	20 4·6	2·270	2·067	— ·317	+ ·160	+ ·152	4·18	4·17	
									5154·22	4·25	
An	291	Sept. 10	19 34·0	5151·285	3·120	— ·382	+ ·006	+ ·008	5154·03	4·03	

Pair 120. W (8·0) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0·518$; $\mu_s = -0''·012$.

		1890									
G	561	July 20	22 18·0	3342·240	1·532	— ·003	— ·017	— ·065	3·75	3·70	2 : 2
	834	Aug. 20	21 12·9	2·951	1·092	— ·160	— ·022	— ·036	3·86	3·85	1–2 : 1–2
									3343·81	3·78	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	934	Sept. 1	17 16·0	3342·935	1·358	— ·212	+ ·238	+ ·207	(½)3344·32	(½) 4·29	3 : 3
J	266	May 29	16 40·3	3340·981	1·717	+ ·240	+ ·747	+ ·746	3343·69	3·68	2 : 2–3
C	149	July 22	18 41·1	3342·562	1·065	— ·013	— ·026	— ·026	3·59	3·59	
	315	Sept. 1	19 57·0	3·082	0·939	— ·216	+ ·067	+ ·171	3·88	3·98	
									3343·74	3·79	
An	298	Sept. 10	21 35·0	3343·098	1·133	— ·245	+ ·004	+ ·005	3343·99	3·99	

Pair 121. Beyond range.

Pair 122. f (7·6) and e (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}365$; $\mu_s = +0''{\cdot}069$.

		1889									
G	70	Sept. 10	22 29·6	2357·425	0·734	— ·185	+ ·219		(½) 8·19	(½) [8·19]	3 : 3
		1890									
	123	Apr. 26	16 44·1	6·896	1·431	+ ·217	+ ·041		8·59	[8·59]	2 : 2
	719	Aug. 13	16 25·8	6·857	1·669	— ·107	— ·008	— ·040	8·41	8·38	2 : 2
	1030	Sept. 29	22 25·5	7·909	0·721	— ·215	+ ·068	·000	8·48	8·42	2–3 : 2–3
									2358·45	8·42	
F	514	July 17	17 25·4	2357·226	1·140	— ·010	+ ·005	+ ·066	8·36	8·42	1 : 2
	951	Sept. 3	17 44·5	7·378	0·975	— ·168	— ·069	+ ·055	(½) 8·12	(½) 8·24	3 : 3
									2358·28	8·36	
J	340	June 12	22 5·8	2356·993	0·709	+ ·114	+ ·501		2358·32	[8·32]	2 : 2
C	36	July 5	19 36·8	2357·252	0·913	+ ·038	+ ·066	+ ·066	8·27	8·27	
	250	Aug. 23	21 11·9	7·101	1·484	— ·140	— ·029	+ ·084	8·42	8·53	
	374	Sept. 18	20 2·1	7·722	1·014	— ·203	+ ·110	+ ·110	8·64	8·64	
									2358·44	8·48	
An	186	May 22	17 44·5	2357·532	0·814	+ ·174	+ ·022	— ·004	2358·54	8·52	

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TABLE III.—*continued.*

Pair 123. Standard Stars.

Pair 124. q (8·3) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}120$; $\mu_s = -\ 0''{\cdot}033$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	″	″	″	″	″	″	″	
G	62	Sept. 10	18 26·6	7229·005	2·237	— ·538	+ ·430		1·13	[1·13]	2 : 2–3
	66	„ 10	21 34·0	8·872	2·584	— ·538	+ ·672		1·59	[1·59]	1–2 : 2–3
		1890									
	731	Aug. 13	21 16·4	9·737	2·457	— ·282	— ·348	— ·364	1·56	1·55	1–2 : 2
	1059	Oct. 7	21 39·9	9·272	2·675	— ·672	— ·174	+ ·022	1·10	1·30	1–2 : 2
									7231·35	1·39	
F	508	July 17	16 28·1	7226·949	4·275	+ ·020	+ ·015	— ·067	7231·26	1·18	1–2 : 2
J	265	May 29	16 31·2	7225·451	4·001	+ ·515	+1·616	+1·579	7231·58	1·55	2 : 2–3
S	127	Sept. 18	21 18·0	7231·122	2·342	— ·590	— ·996	—1·098	7231·88	1·78	
An	209	May 24	18 17·5	7228·393	2·487	+ ·551	+ ·354	+ ·493	7231·79	1·92	

Pair 125. e (8·2) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}677$; $\mu_s = +\ 0''{\cdot}070$.

G	718	1890 Aug. 13	16 17·2	4370·574	3·387	— ·197	— ·015	— ·081	4373·75	3·68	2
F	968	Sept. 9	17 56·8	4371·916	1·813	— ·337	+ ·203	+ ·190	4373·60	3·58	1–2 : 2·3
J	262	May 29	15 53·8	4368·372	4·115	+ ·290	+ ·977	+ ·900	4373·75	3·68	2–3 : 2–3
C	39	July 5	20 30·4	4371·190	2·307	+ ·063	+ ·122	+ ·122	4373·68	3·68	.
S	22	June 4	18 24·0	4371·828	1·934	+ ·259	+ ·011	+ ·014	4374·03	4·04	

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TABLE III.—*continued.*

Pair 126. d (8·4) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}084$; $\mu_s = +\ 0''{\cdot}019$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	717	Aug. 13	16 10·4	6995·475	5·717	— ·313	— ·024	— ·119	7000·86	0·76	2 : 2
F	1035	Oct. 2	21 9·8	6999·331	1·998	— ·646	+ ·108	+ ·108	7000·79	0·79	1–2 : 1–2
J	261	May 29	15 42·5	6991·487	7·379	+ ·465	+1·564	+1·431	7000·90	0·76	2–3 : 2–3
C	50	July 8	18 1·7	6999·121	2·282	+ ·089	— ·163	— ·163	7001·33	1·33	
S	31	June 8	19 15·0	6996·323	4·012	+ ·380	— ·234	— ·314	7000·48	0·40	

Pair 127. t (7·8) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}610$; $\mu_s = -\ 0''{\cdot}040$.

G	359	1890 June 16	16 22·3	3936·648	2·314	+ ·197	+ ·164	+ ·037	(½) 9·32	(½) 9·20	3 : 3
	734	Aug. 13	21 39·0	8·144	1·486	— ·150	— ·190	— ·250	9·29	9·23	1–2 : 2
									3939·30	9·22	
F	935	Sept. 1	17 24·5	3938·222	1·501	— ·250	+ ·280	+ ·268	(½)3939·75	(½) 9·74	3 : 3
J	249	May 27	17 29·5	3936·993	1·479	+ ·290	+ ·610	+ ·378	3939·37	9·14	2 : 2
C	143	July 21	18 37·4	3937·610	1·293	— ·013	+ ·287	+ ·287	9·18	9·18	
	310	Sept. 1	18 51·5	8·345	1·230	— ·254	+ ·079	+ ·104	9·40	9·42	
									3939·29	9·30	
S	44	June 25	19 35·5	3937·789	1·107	+ ·147	+ ·673	+ ·720	9·71	9·76	
	152	Oct. 11	21 59·5	7·873	1·497	— ·342	+ ·017	+ ·049	9·05	9·08	
									3939·38	9·42	

Pair 128. m (5·0) and g (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}469$; $\mu_s = +\ 0''{\cdot}082$.

G	989	1890 Sept. 18	21 31·7	3025·507	1·244	— ·254	+ ·042	+ ·106	(½)3026·54	(½) 6·60	2–3 : 3–4
F	661	Aug. 5	21 40·1	3025·815	1·330	— ·097	— ·151	— ·023	3026·90	7·03	1–2 : 2 ft.

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance I.	Resulting Distance II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
J	263	May 29	16 6·5	3024·380	1·489	+ ·203	+ ·677	+ ·633	3026·75	6·71	2–3 : 2–3
C	65	July 9	20 33·2	3025·546	0·850	+ ·025	— ·038	— ·070	3026·38	6·35	
S	75	July 13	18 51·5	3025·248	1·078	+ ·011	— ·327	— ·253	3026·01	6·08	

Pair 129. z (8·5) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}469$; $\mu_s = +\ 0''{\cdot}028$.

G	739	1890 Aug. 13	22 27·6	3025·678	1·160	— ·109	— ·146	— ·258	3026·58	6·47	2 : 2–3
F	1158	Oct. 18	20 59·3	3026·204	1·066	— ·289	— ·072	+ ·089	3026·91	7·07	1–2 : 2
J	250	May 27	17 48·6	3024·852	1·319	— ·230	+ ·469	+ ·234	3026·41	6·18	
C	199	Aug. 6	22 1·2	3024·887	2·307	— ·076	+ ·042	+ ·014	3027·16	7·13	
S	85	July 14	20 2·5	3024·483	2·664	+ ·033	— ·054	— ·052	3027·13	7·13	

Pair 130. x (8·0) and β (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}702$; $\mu_s = -\ 0''{\cdot}064$.

G	1015	1890 Sept. 26	21 56·3	4533·751	1·281	— ·392	— ·150	— ·126	4534·49	4·51	2–3 : 2–3
F	666	Aug. 5	22 40·3	4533·460	1·414	— ·110	— ·227	— ·183	4534·54	4·55	1–2 : 2 ft.
J	268	May 29	17 2·8	4530·688	2·809	+ ·332	+1·014	+1·074	4534·84	4·90	2 : 2–3
C	187	Aug. 6	18 5·3	4533·685	1·268	— ·114	+ ·063	— ·126	4534·90	4·71	
An	218	Aug. 17	20 17·0	4533·001	2·259	— ·191	+ ·017	+ ·014	4535·09	5·08	

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TABLE III.—*continued.*

Pair 131. k (7·5) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}001$; $\mu_s = +0''{\cdot}072$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	987	Sept. 18	21 3·8	6463·323	1·864	— ·547	+ ·089	+ ·340	(½)6464·73	(½) 4·98	2–3 : 3–4
F	664	Aug. 5	22 16·1	6463·042	2·367	— ·216	— ·323	— ·175	6464·87	5·03	1–2 : 2 ft.
J	260	May 29	15 33·2	6456·963	7·290	+ ·428	+1·444	+1·321	(6466·13)	(6·00)	Rejected.
C	24	June 30	17 55·6	6463·396	1·775	+ ·140	— ·701	— ·380	6464·61	4·93	
An	230	Aug. 18	20 51·0	6462·234	3·264	— ·335	— ·198	— ·280	6464·97	4·88	

Pair 132. y (8·2) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}902$; $\mu_s = +0''{\cdot}034$.

		1890									
G	430	July 10	17 6·5	5820·706	2·660	+ ·092	+ ·137	+ ·108	(½) 3·60	(½) 3·57	3 : 2–3
	735	Aug. 13	21 45·4	1·644	2·141	— ·217	— ·280	— ·388	3·29	3·18	1–2 : 2
									5823·39	3·31	
F	959	Sept. 3	22 36·9	5821·691	2·749	— ·380	— ·376	— ·338	(½)5823·68	(½) 3·72	3 : 3
J	267	May 29	16 51·5	5819·079	2·913	+ ·423	+1·301	+1·330	5823·72	3·75	2 : 2
C	160	July 31	18 29·0	5821·630	1·813	— ·114	— ·063	— ·063	3·27	3·27	
	321	Sept. 1	21 18·1	1·921	1·965	— ·368	+ ·117	— ·135	3·64	3·38	
									5823·46	3·33	
S*	122	Sept. 18	20 7·5	5825·993	1·594	— ·470	— ·802	— ·830	(5826·32)	(6·29)	Rejected.

* One of micrometer readings marked doubtful.

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TABLE III.—*continued.*

Pair 133. ϵ (6·3) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}248$; $\mu_s = -\ 0''{\cdot}013$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	809	Aug. 19	17 57·3	1598·142	0·764	— ·068	+ ·056	+ ·035	1598·89	8·87	1–2 : 2–3
F	958	Sept. 3	22 27·2	1598·272	0·521	— ·100	— ·103	— ·094	1598·59	8·60	2 : 3
J	246	May 27	16 38·5	1597·073	1·253	+ ·123	+ ·248	+ ·236	1598·70	8·69	2–3 : 2–3
C	225	Aug. 16	20 5·5	1598·047	0·774	— ·063	+ ·047	+ ·047	1598·81	8·81	
An	250	Aug. 22	21 58·0	1597·191	1·894	— ·074	— ·078	— ·122	1598·93	8·89	

Pair 134. g (8·5) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}899$; $\mu_s = +\ 0''{\cdot}002$.

G	998	1890 Sept. 21	21 6·9	5801·586	1·757	— ·498	+ ·207	+ ·225	5803·05	3·07	2 : 2–3
F	663	Aug. 5	22 5·1	5801·458	2·125	— ·183	— ·290	— ·135	5803·11	3·27	1–2 : 2 faint.
J	247	May 27	16 59·5	5799·089	2·938	+ ·405	+ ·899	+ ·719	5803·33	3·15	2 : 2
C	69	July 11	18 33·8	5801·225	1·623	+ ·038	+ ·279	+ ·280	5803·17	3·17	
An	313	Sept. 13	22 36·0	5797·308	6·316	— ·462	+ ·021	+ ·135	5803·18	3·30	

Pair 135. E (8·0) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}940$; $\mu_s = -\ 0''{\cdot}012$.

F	970	1890 Sept. 9	18 14·0	6075·094	2·142	— ·467	+ ·282	+ ·301	6077·05	7·07	1–2 : 2–3
J	219	May 21	17 7·6	6072·952	2·244	+ ·459	+1·424	+ ·968	6077·08	6·62	
C	71	July 11	19 14·3	6073·489	3·602	+ ·038	+ ·291	+ ·291	6077·42	7·42	
An	266	Aug. 30	21 12·5	6071·862	5·837	— ·403	+ ·254	+ ·376	6077·55	7·67	

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TABLE III.—*continued.*

Pair 136. F (8·3) and w (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}795$; $\mu_s = +\ 0''{\cdot}015$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	363	June 16	17 1·0	5150·590	2·206	+ ·261	+ ·084	+ ·024	3·14	3·08	2–3 : 3
	560	July 20	22 6·3	0·841	2·139	— ·003	— ·026	— ·060	2·95	2·92	2 : 2
	738	Aug. 13	22 13·0	1·257	2·165	— ·194	— ·247	— ·405	2·98	2·82	2 : 2–3
									5153·02	2·94	
F	974	Sept. 9	21 19·7	5151·812	1·940	— ·372	— ·334	— ·338	5153·05	3·04	2–3 : 2–3 faint.
J	218	May 21	16 51·2	5149·200	2·297	+ ·411	+1·204	+ ·914	5153·11	2·82	2 : 2–3
C	162	July 31	19 10·0	5150·026	2·993	— ·089	— ·056	— ·143	2·87	2·79	
	325	Sept. 3	20 11·3	0·572	3·056	— ·342	+ ·095	+ ·080	3·39	3·37	
									5153·13	3·08	
An	281	Sept. 2	19 28·3	5149·715	4·858	— ·331	+ ·060	+ ·064	(5154·30)	(4·31)	Rejected.

Pair 137. r (7·8) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}618$; $\mu_s = -\ 0''{\cdot}021$.

		1890									
G	362	June 16	16 51·3	3989·747	1·126	+ ·195	+ ·065	+ ·025	1·13	1·09	2–3 : 3
	751	Aug. 15	17 6·9	9·898	1·135	— ·167	+ ·034	— ·006	(½) 0·90	(½) 0·86	3 : 3
									3991·05	1·01	
F	942	Sept. 1	21 18·6	3989·505	1·761	— ·256	— ·068	— ·093	3990·94	0·92	2 : 2–3
J	214	May 18	15 55·6	3988·833	1·134	+ ·324	+1·003		3991·29	[1·29]	2–3 : 2
C	128	July 20	17 46·9	3987·713	2·980	— ·013	+ ·006	+ ·074	0·69	0·75	
	293	Aug. 30	19 51·0	9·780	1·763	— ·254	+ ·124	+ ·136	1·41	1·43	
									3991·05	1·09	
An	290	Sept. 10	19 23·8	3988·729	2·703	— ·296	+ ·005	+ ·006	3991·14	1·14	

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TABLE III.—*continued.*

Pair 138. f (7·6) and b (8·3) ; $\frac{\sigma}{\Sigma_0} = 1·035$; $\mu_s = +0''·001$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1889	h m	′	″	″	″	″	″	″	
G	76	Sept. 11	22 10·3	6676·901	1·886	− ·535	+ ·294	+ ·248	8·55	8·50	2–3 : 2–3
		1890									
	729	Aug. 13	21 0·8	7·105	1·987	− ·308	− ·322	− ·269	8·46	8·52	1–2 : 2
									6678·51	8·51	
F	956	Sept. 3	22 1·7	6677·935	1·842	− ·482	− ·432	− ·435	6678·86	8·86	2 : 3
J	215	May 18	16 8·7	6672·279	5·206	+ ·516	+1·680		6679·68	[9·68]	2 : 2
C	14	June 27	19 57·4	6676·626	3·411	+ ·178	− ·114	− ·238	(80·11)	(79·98)	Rejected.
	439	Oct. 5	21 29 0	3·965	5·389	− ·634	− ·124	− ·176	78·60	78·54	
									6678·60	78·54	
An	188	May 22	18 8·5	6674·500	3·680	+ ·490	+ ·062	+ ·155	6678·73	8·83	

Pair 139. p (7·7) and r (7·8) ; $\frac{\sigma}{\Sigma_0} = 0·782$; $\mu_s = +0''·019$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890									
G	139	April 29	15 48·6	5042·288	5·714	+ ·463	+ ·322	+ ·446	(½) 8·79	(½) 8·91	3 : 3
	408	July 4	17 0·4	6·088	2·898	+ ·107	+ ·174	+ ·086	9·27	9·18	2 : 2 faint.
	748	Aug. 15	16 36·9	5·705	3·494	− ·218	+ ·043	− ·039	(½) 9·02	(½) 8·94	3 : 3–4
									5049·09	9·05	
F	704	Aug. 9	16 23·2	5045·069	3·997	− ·174	+ ·087	− ·020	8·98	8·87	2 : 2–3
	741	„ 14	16 18·9	4·424	4·156	− ·211	+ ·076	+ ·156	(½) 8·45	(½) 8·53	3 : 3–4
									5048·80	8·76	
J	206	May 13	17 2·1	5044·593	2·870	+ ·424	+1·160	+1·048	5049·05	8·94	1–2 : 2
C	114	July 18	20 54·8	5046·445	2·307	− ·013	+ ·070	− ·063	8·81	8·68	
	280	Aug. 28	19 17·0	7·460	1·560	− ·317	+ ·133	+ ·133	8·83	8·83	
	390	Sept. 19	21 0·4	6·648	2·371	− ·418	+ ·407	+ ·407	9·01	9·01	
									5048·88	8·84	
S	114	Sept. 17	20 52·5	5046·787	2·772	− ·410	− ·615	− ·657	5048·53	8·49	
An	197	May 23	17 47·5	5046·643	1·445	+ ·382	− ·239	− ·391	5048·23	8·08	

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TABLE III.—*continued.*

Pair 140. q (8·3) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}602$; $\mu_s = -\ 0''{\cdot}022$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	431	July 10	17 15·0	3887·348	1·609	+ ·050	+ ·092	+ ·066	(½) 9·10	(½) 9·07	3 : 2–3
	806	Aug. 19	17 35·2	7·834	1·447	— ·188	+ ·135	+ ·054	9·23	9·15	2 : 3
									3889·19	9·12	
F	706	Aug. 9	16 39·9	3887·213	2·054	— ·132	+ ·067	·000	3889·20	9·14	2 : 2–3
J	208	May 13	17 30·4	3886·129	1·475	+ ·331	+ ·893	+ ·746	3888·83	8·68	1–2 : 2
C	122	July 19	19 14·1	3887·583	1·115	·000	+ ·211	+ ·313	8·91	9·01	
	290	Aug. 30	19 12·3	8·217	1·090	— ·241	+ ·120	+ ·170	9·19	9·24	
									3889·05	9·13	
S	128	Sept. 18	21 31·5	3888·317	1·389	— ·319	— ·535	— ·578	3888·85	8·81	
An	210	May 24	18 27·5	3887·138	1·242	+ ·295	+ ·190	+ ·289	3888·87	8·96	

Pair 141. e (8·2) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}901$; $\mu_s = +\ 0''{\cdot}141$.

		1890									
G	137	April 29	15 22·8	5811·393	7·373	+ ·530	+ ·371	+ ·423	(½) 19·67	(½) 19·72	3 : 3
	345	June 14	16 14·9	5·535	4·090	+ ·271	— ·068	+ ·090	19·83	19·99	
	517	July 17	21 54·3	7·518	2·066	— ·021	+ ·023	+ ·225	19·59	19·79	1–2 : 2–3
	800	Aug. 19	16 38·3	6·876	3·384	— ·307	+ ·203	+ ·180	(½) 20·16	(½) 20·13	2–3 : 3–4
	861	„ 25	21 4·2	8·277	1·725	— ·352	— ·093	— ·086	19·55	19·56	2 : 2–3
									5819·72*	19·82	
F	548	July 20	15 45·4	5814·672	5·673	— ·048	— ·134	— ·198	20·16	20·10	2 : 3
	702	Aug. 9	16 6·4	5·868	4·501	— ·226	+ ·100	+ ·009	20·24	20·15	2 : 2–3
	760	„ 15	21 17·1	8·918	1·769	— ·276	— ·456	— ·460	(½) 19·96	(½) 19·95	3 : 3
	1162	Oct. 18	21 37·6	8·651	1·847	— ·552	— ·139	+ ·023	19·81	19·97	2–3 : 3
									5820·05	20·06	
J	242	May 24	17 44·8	5816·308	2·280	+ ·420	+1·256	+1·189	5820·26	20·20	1–2 : 2

* 5819″·75 used.

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	51	July 8	18 23·0	5818·319	1·547	+ ·076	− ·135	− ·135	19·80	19·80	
	254	Aug. 24	19 43·4	8·967	1·851	− ·342	+ ·108	+ ·279	20·58	20·76	
	360	Sept. 7	21 7·1	7·267	2·663	− ·431	− ·036	− ·342	19·46	19·16	
	377	„ 18	20 35·4	7·977	2·245	− ·481	+ ·270	+ ·270	20·01	20·01	
	414	„ 24	19 58·7	8·789	1·978	− ·507	+ ·396	+ ·297	20·66	20·56	
									5820·10	20·06	
S	18	June 1	18 4·0	5818·659	1·629	+ ·368	− ·377	− ·378	20·28	20·28	
	139	Oct. 8	21 58·5	5·838	4·838	− ·549	− ·047	− ·135	20·08	19·99	
									5820·18	20·14	

Pair 142. d (8·4) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}940$; $\mu_s = -\ 0''{\cdot}004$.

G	518	1890 July 17	22 6·3	6067·629	1·802	− ·026	+ ·024	+ ·165	6069·43	9·57	1–2 : 2–3
F	965	Sept. 5	22 6·2	6068·741	1·747	− ·446	− ·423	− ·432	6069·62	9·61	1–2 : 2
J	245	May 27	16 20·8	6064·184	4·302	+ ·416	+ ·940	+1·006	6069·84	9·91	2–3 : 2–3
C	29	June 30	20 19·0	6066·729	3·386	+ ·140	− ·667	− ·724	6069·59	9·54	
S	32	June 8	19 26·0	6065·111	4·236	+ ·328	− ·203	− ·216	6069·47	9·46	

Pair 143. t (7·8) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}093$; $\mu_s = -\ 0''{\cdot}028$.

G	360	1890 June 16	16 29·7	601·602	0·287	+ ·030	+ ·010	+ ·006	(½) 601·93	(½) 1·93	3 : 3
F	707	Aug. 9	16 48·3	601·551	0·256	− ·020	+ ·010	+ ·003	1·80	1·79	2 : 2·3
	715	„ 12	17 0·5	1·456	0·242	− ·022	− ·010		1·67	[1·67]	2 : 3
									601·74	1·73	
J	213	May 18	15 46·3	600·949	0·438	+ ·049	+ ·151		601·59	[1·59]	2–3 : 2

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	140	July 21	17 49·6	601·148	0·279	·000	+ ·044	+ ·044	1·47	1·47	
	305	Aug. 31	20 50·2	1·160	0·165	— ·038	+ ·030	+ ·017	1·32	1·31	
									601·40	1·39	
S	55	July 10	17 49·0	601·146	0·317	+ ·009	— ·029	— ·040	1·44	1·43	
	155	Oct. 13	20 46·5	1·334	0·168	— ·056	+ ·005	— ·006	1·44	1·44	
									601·44	1·44	

Pair 144. m (5·0) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}403$; $\mu_s = +\ 0''{\cdot}096$.

G	982	1890 Sept. 10	22 30·0	2601·134	1·757	— ·202	+ ·042	+ ·016	(¼) 2602·73	(¼) 2·71	4 : 4
F	662	Aug. 5	21 51·7	2601·832	1·353	— ·084	— ·130	— ·040	2602·97	3·06	1–2 : 2 faint.
J	203	May 13	16 12·9	2600·742	0·940	+ ·215	+ ·598	+ ·637	2602·50	2·53	2 : 1–2
C	76	July 13	18 22·2	2601·478	1·192	+ ·013	+ ·040	+ ·145	2602·72	2·83	
S	74	July 13	18 39·5	2601·603	1·350	+ ·009	— ·281	— ·242	2602·68	2·72	

Pair 145. z (8·5) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}796$; $\mu_s = -\ 0''{\cdot}050$.

G	838	1890 Aug. 20	21 48·4	5136·988	1·512	— ·231	— ·034	— ·072	5138·24	8·20	1–2 : 1–2
F	1042	Oct. 4	21 23·0	5137·816	1·457	— ·466	— ·005	+ ·135	5138·80	8·94	2 : 2–3
J	240	May 24	17 17·4	5134·446	2·853	+ ·407	+1·108	+1·067	5138·81	8·77	1–2 : 2
C	205	Aug. 7	19 18·3	5136·799	1·484	— ·152	— ·127	+ ·088	5138·00	8·22	
S	83	July 14	19 19·5	5136·972	1·639	+ ·063	— ·091	— ·088	5138·58	8·59	

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TABLE III.—*continued.*

Pair 146. x (8·0) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}708$; $\mu_s = +\ 0''{\cdot}072$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	317	June 11	16 42·2	4570·880	1·641	+ ·260	+ ·006	+ ·135	2·79	2·92	2–3 : 3
	753	Aug. 15	17 26·9	2·041	1·408	— ·187	+ ·039	+ ·035	3·30	3·30	2–3 : 3
									4573·05*	3·11	
F	709	Aug. 9	17 4·2	4571·597	1·529	— ·147	+ ·078	+ ·085	4573·06	3·06	2 : 2–3
J	209	May 13	17 50·9	4570·151	1·329	+ ·393	+1·050	+ ·835	4572·92	2·71	2–3 : 2–3
C	150	July 22	18 54·6	4571·488	1·851	— ·025	— ·035	— ·035	3·28	3·28	
	316	Sept. 1	20 9·5	2·122	1·420	— ·292	+ ·092	+ ·212	3·34	3·46	
									4573·31	3·37	
S	181	Nov. 16	22 22·0	4572·129	1·309	— ·388	+ ·011	— ·014	4573·06	3·04	
An	223	Aug. 18	19 32·5	4571·782	1·785	— ·207	— ·140	— ·078	4573·22	3·28	

* 4573″·06 used.

Pair 147. y (8·2) and ϵ (6·3) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}700$; $\mu_s = -\ 0''{\cdot}019$.

G	1016	1890 Sept. 26	22 5·7	4503·143	1·962	— ·387	— ·148	— ·133	4504·57	4·59	2–3 : 2–3
F	659	Aug. 5	16 57·6	4502·838	1·845	— ·103	+ ·038	+ ·223	4504·62	4·80	2 : 2–3
J	204	May 13	16 26·5	4501·371	2·278	+ ·394	+1·034	+1·047	4505·08	5·09	1–2 : 2
C	196	Aug. 6	21 11·0	4503·719	1·242	— ·114	+ ·063	+ ·007	4504·96	4·86	
An	236	Aug. 21	19 46·0	4503·820	1·439	— ·209	— ·119	— ·147	4504·93	4·90	

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TABLE III.—*continued.*

Pair 148. ε (6·3) and α (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}935$; $\mu_s = +\ 0''{\cdot}022$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition I. S.
		1890	h m	″	″	″	″	″	″	″	
G	559	July 20	21 56·1	6036·448	1·792	+ ·013	− ·031	− ·023	8·22	8·33	2 : 2
	819	Aug. 19	21 57·7	7·002	1·739	− ·267	− ·043	− ·122	8·43	8·35	(2 : 3)
									6038·33	8·34	
F	963	Sept. 5	21 44·5	6037·019	1·781	− ·402	− ·421	− ·337	6037·98	8·06	1–2 : 2
J	205	May 13	16 38·4	6032·117	4·491	+ ·531	+1·387	+1·346	6038·53	8·49	1–2 : 2
C	208	Aug. 7	20 56·1	6034·569	3·627	− ·178	− ·150	+ ·870	7·87	8·89	
	342	Sept. 4	20 59·3	5·140	3·690	− ·393	+ ·299	+ ·374	8·74	8·81	
									6038·31	8·85	
An	255	Aug. 30	19 4·5	6034·249	3·812	− ·357	+ ·252	+ ·075	6037·96	7·78	

Pair 149. g (8·5) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}126$; $\mu_s = -\ 0''{\cdot}035$.

G	1002	1890 Sept. 21	22 1·4	814·435	0·237	− ·069	+ ·029	+ ·011	814·63	4·61	2 : 2
F	655	Aug. 5	16 10·0	813·799	0·681	− ·026	+ ·007	+ ·011	814·46	4·47	2 : 3
J	238	May 24	16 45·9	813·312	0·509	+ ·058	+ ·176	+ ·174	814·06	4·05	1–2 : 2
C	59	July 9	18 27·8	813·886	0·266	+ ·013	− ·010	·000	4·15	4·16	
	445	Oct. 8	21 9·9	4·228	0·507	− ·076	− ·008	− ·015	4·65	4·64	
									814·40	4·40	
S	123	Sept. 18	20 24·0	814·082	0·513	− ·067	− ·112	− ·121	814·42	4·41	

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TABLE III.—*continued.*

Pair 150. E (8·0) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}929$; $\mu_s = -0''{\cdot}023$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	1069	Oct. 7	23 5·5	6017·903	3·022	— ·564	— ·144	— ·418	6020·22	19·94	2–3 : 2–3
F	761	Aug. 15	21 26·1	6018·619	2·297	— ·281	— ·470	— ·474	(½)6020·17	(½) 20·16	3 : 3
J	239	May 24	17 4·3	6016·205	2·593	+ ·437	+1·294	+1·263	6020·53	20·50	1–2 : 2
C	81	July 13	20 20·4	6016·132	3·690	+ ·025	+ ·093	— ·437	6019·94	19·41	
An	264	Aug. 30	20 52·5	6014·335	6·180	— ·397	+ ·251	+ ·325	6020·37	20·44	

Pair 151. F (8·3) and y (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}909$; $\mu_s = -0''{\cdot}017$.

G	992	1890 Sept. 18	22 5·7	5912·803	1·669	— ·474	+ ·081	+ ·027	5914·08	4·03	2–3 : 3–4
F	613	July 24	23 7·8	5912·581	1·702	+ ·035	— ·381	— ·436	5913·94	3·88	
J	198	May 10	17 0·5	5908·339	3·626	+ ·050	+1·835	+1·754	5913·85	3·77	2 : 2 faint
C	170	Aug. 3	19 11·5	5911·831	2·536	— ·140	— ·418	— ·473	5913·81	3·76	
An	278	Sept. 1	23 27·0	5894·720	19·411	— ·369	— ·013	— ·136	5913·75	3·63	

Pair 152. f (7·6) and o (7·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}052$; $\mu_s = +0''{\cdot}038$.

G	346	1890 June 14	16 25·0	6790·975	4·701	+ ·323	— ·080	+ ·053	6795·92*	6·05	
F	701	Aug. 9	15 57·2	6790·244	6·273	— ·256	+ ·117	+ ·032	6·38	6·29	2 : 2–3
	759	„ 15	21 7·6	4·225	1·963	— ·314	— ·532	— ·526	(½) 5·34	(½) 5·35	3 : 3
									6796·03	5·98	
J	196	May 10	16 28·2	6789·011	4·603	+ ·577	+2·124	+2·104	6796·32	6·30	2 : 2 faint

* 6796″·08 used.

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	′	″	″	″	″	″	″	
C	58	July 9	18 3·2	6793·586	1·889	+ ·063	— ·084	+ ·021	5·46	5·56	
	444	Oct. 8	20 52·8	3·191	3·094	— ·659	— ·074	— ·053	5·56	5·58	
									6795·51	5·57	
S	5	May 19	17 56·5	6794·519	1·884	+ ·527	—1·033	— ·989	6795·90	5·94	

Pair 153. p (7·7) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}916$; $\mu_s = -\ 0''{\cdot}014$.

G	924	1890 Aug. 31	17 42·6	5908·745	2·088	— ·390	+ ·115	+ ·069	5910·56	10·51	1–2 : 2–3
F	654	Aug. 5	15 59·5	5906·590	4·192	— ·184	+ ·050	+ ·037	5910·65	10·64	2 : 3
J	195	May 10	16 6·4	5904·487	3·902	+ ·503	+1·849	+1·894	5910·74	10·79	2 : 2 faint.
C	78	July 13	19 25·5	5908·939	1·649	+ ·025	+ ·092	— ·073	5910·71	10·55	
An	200	May 23	18 22·0	5907·749	1·831	+ ·438	— ·280	— ·092	5909·74	9·93	

Pair 154. q (8·3) and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}854$; $\mu_s = 0''{\cdot}000$.

G	145	1890 Apr. 29	16 49·3	5513·473	3·446	+ ·510	+ ·352	+ ·406	7·78	7·84	2–3 : 3
	817	Aug. 19	21 35·7	6·565	1·545	— ·277	— ·039	— ·051	7·79	7·78	(2 : 3)
	862	„ 25	21 13·9	6·401	1·556	— ·321	— ·088	— ·068	7·55	7·57	2 : 2–3
									5517·71	7·73	
F	550	July 20	16 4·9	5512·980	5·198	— ·028	— ·127	— ·149	8·02	8·00	2 : 3
	612	„ 24	22 53·9	6·157	1·784	— ·062	— ·358	— ·342	7·52	7·54	1–2 : 3
									5517·77	7·77	
J	244	May 27	16 5·3	5511·164	5·097	+ ·394	+ ·854	+ ·999	5517·51	7·65	2–3 : 2–3

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	107	July 18	18 18·0	5516·027	1·700	— ·013	+ ·077	+ ·196	7·80	7·92	
	273	Aug. 27	20 49·1	5·089	2·853	— ·330	— ·128	+ ·077	7·48	7·69	
	386	Sept. 19	20 17·1	5·495	2·472	— ·456	+ ·444	+ ·444	7·95	7·95	
									5517·74	7·85	
S	16	June 1	17 22·5	5515·434	1·897	+ ·364	— ·357	— ·359	7·34	7·34	
	138	Oct. 8	21 43·5	3·234	5·768	— ·519	— ·044	— ·077	8·44	8·41	
									5517·89	7·87	

Pair 155. *e* (8·2) and *g* (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}551$; $\mu_s = +\ 0''{\cdot}105$.

G	930	1890 Aug. 31	21 12·8	3560·042	1·015	— ·242	— ·012	— ·011	3560·80	0·80	1–2 : 2–3
F	656	Aug. 5	16 21·3	3558·502	2·618	— ·119	+ ·030	+ ·083	3561·03	1·08	2 : 3
J	200	May 10	17 39·7	3557·937	1·599	+ ·299	+1·113	+1·036	3560·95	0·87	2 : 2 faint.
C	37	July 5	19 55·9	3559·459	1·636	+ ·051	+ ·099	+ ·099	3561·25	1·25	
S	20	June 1	18 55·0	3559·215	1·805	+ ·223	— ·230	— ·231	3561·01	1·01	

Pair 156. *d* (8·4) and *c* (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}451$; $\mu_s = +\ 0''{\cdot}040$.

G	357	1890 June 16	15 57·0	2909·602	0·951	+ ·123	+ ·047	+ ·054	(½) 0·72	(½) 0·73	3 : 3
	812	Aug. 19	20 51·0	9·595	1·190	— ·158	— ·021	+ ·034	0·61	0·66	2 : 3
									2910·65	0·68	
F	1050	Oct. 6	21 22·5	2909·558	1·283	— ·274	+ ·079	+ ·192	2910·65	0·76	1 : 2–3
J	220	May 21	17 27·6	2908·473	0·959	+ ·216	+ ·683	+ ·406	2910·33	0·05	2 : 2–3

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
C	18	June 28	18 13·2	2909·146	1·864	+ ·063	+ ·072	+ ·072	1·14	1·14	
	241	Aug. 23	18 49·2	9·680	1·738	— ·165	— ·036	— ·059	1·21	1·19	
									2911·18	1·17	
S	36	June 20	18 51·0	2907·945	2·606	+ ·106	— ·049	— ·050	0·61	0·61	
	145	Oct. 9	21 17·5	8·741	2·442	— ·276	+ ·009	+ ·050	0·92	0·96	
									2910·77	0·81	

Pair 157. m (5·0) and c (8·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}091$; $\mu_s = +\ 0''{\cdot}129$.

		1890									
G	522	July 17	22 58·5	7046·315	4·381	— ·027	+ ·027	— ·136	7050·70	0·53	1–2 : 2–3
F	1161	Oct. 18	21 27·1	7049·483	2·347	— ·668	— ·168	+ ·082	7050·99	1·24	2–3 : 3
J	217	May 21	16 20·3	7043·914	4·338	+ ·528	+1·653	+1·506	7050·43	0·29	2 : 2–3
C	25	June 30	18 29·0	7048·956	1·978	+ ·152	— ·774	— ·534	7050·32	0·56	
S	87	July 13	19 5·0	7049·633	1·943	+ ·018	— ·762	— ·535	7050·83	1·06	

Pair 158. z (8·5) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}028$; $\mu_s = +\ 0''{\cdot}002$.

		1890									
G	318	June 11	16 51·2	6637·646	2·641	+ ·383	+ ·009	+ ·226	0·68	0·90	2–3 : 3
	358	„ 16	16 10·0	6·356	3·562	+ ·340	+ ·108	+ ·093	(½) 0·37	(½) 0·35	3 : 3
	523	July 17	23 7·7	5·915	5·111	+ ·032	+ ·026	— ·175	1·08	0·88	1–2 : 2–3
	895	Aug. 28	21 36·0	8·826	2·624	— ·385	— ·257	— ·380	0·81	0·69	2 : 2
	1081	Oct. 9	21 16·5	8·463	2·387	— ·621	+ ·040	+ ·350	0·27	0·58	2 : 3
									6640·67	0·72	
F	708	Aug. 9	16 56·4	6638·072	2·611	— ·208	+ ·114	+ ·062	0·59	0·54	2 : 2–3
	1072	Oct. 8	20 48·7	9·302	2·172	— ·619	— ·111	+ ·103	(½) 0·74	(½) 0·96	3 : 3
	1096	„ 10	20 54·0	8·958	2·161	— ·623	+ ·410	+ ·206	0·91	0·70	2–3 : 3
	1112	„ 12	20 46·2	9·282	2·138	— ·627	+ ·421	+ ·185	(½) 1·21	(½) 0·98	3 : 3–4
									6640·83	0·74	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
J	235	May 24	16 5·5	6634·724	3·759	+ ·516	+1·432	+1·491	6640·43	0·49	1–2 : 2
C	161	July 31	18 50·3	6638·495	2·371	— ·114	— ·072	— ·124	0·69	0·64	
	322	Sept. 1	21 32·6	9·409	1·927	— ·418	+ ·134	— ·299	1·05	0·62	
	366	„ 8	20 14·1	8·927	1·889	— ·469	+ ·597	+ ·597	0·95	0·95	
	405	„ 23	19 53·2	9·092	1·953	— ·558	+ ·185	+ ·185	0·68	0·68	
	420	„ 24	21 15·5	8·470	1·940	— ·558	+ ·453	+ ·525	0·30	0·38	
									6640·73	0·65	
S	94	July 26	19 15·0	6637·942	2·458	— ·064	— ·134	— ·175	6640·20	0·16	
An	318	Nov. 10	21 49·5	6639·268	1·903	— ·594	+ ·190	+ ·103	6640·77	0·68	

Pair 159. x (8·0) and v (6·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}517$; $\mu_s = +\ 0''{\cdot}042$.

		1890									
G	347	June 14	16 47·0	3339·691	1·206	+ ·178	— ·039	— ·036	1·04	1·04	
	805	Aug. 19	17 23·7	9·985	1·059	— ·155	+ ·116	+ ·039	1·01	0·93	2 : 3
									3341·03*	0·99	
F	1043	Oct. 4	21 36·0	3339·777	1·373	— ·305	— ·003	+ ·065	3340·84	0·91	2 : 2–3
J	201	May 10	18 7·6	3338·325	0·971	+ ·294	+1·044	+ ·956	3340·63	0·55	2 : 2 faint.
C	159	July 31	18 12·1	3339·037	1·573	— ·063	— ·036	— ·005	0·51	0·54	
	320	Sept. 1	21 5·7	9·898	0·939	— ·216	+ ·067	— ·010	0·55	0·61	
									3340·53	0·58	
S	180	Nov. 16	22 10·5	3339·820	0·955	— ·284	+ ·008	— ·010	3340·50	0·48	
An	222	Aug. 18	19 23·5	3339·664	1·314	— ·150	— ·102	— ·052	3340·73	0·78	

* 3341″·06 used.

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TABLE III.—*continued.*

Pair 160. y (8·2) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}074$; $\mu_s = +\ 0''{\cdot}072$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	991	Sept. 18	21 53·9	6931·740	2·701	— ·560	+ ·096	+ ·107	6933·98	3·99	2–3 : 3–4
F	658	Aug. 5	16 46·6	6930·837	3·398	— ·176	+ ·059	+ ·279	6934·12	4·34	2 : 3
J	197	May 10	16 44·4	6928·169	3·434	+ ·611	+2·168	+2·094	6934·38	4·31	2 : 2 faint.
C	151	July 22	19 12·2	6931·873	2·080	— ·025	— ·054	— ·054	6933·88	3·88	
An	243	Aug. 22	20 7·0	6932·951	1·906	— ·348	— ·338	— ·322	6934·17	4·19	

Pair 161. ϵ (6·3) and δ (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}776$; $\mu_s = -\ 0''{\cdot}040$.

G	542	1890 July 19	16 40·3	5009·239	2·714	+ ·023	+ ·422		2·40	[2·40]	(2 : 2–3)
	583	„ 22	17 56·0	10·299	2·099	— ·001	+ ·272	+ ·287	2·67	2·68	1 : 2–3
	757	Aug. 15	17 55·9	10·359	2·054	— ·189	+ ·043	+ ·147	2·27	2·37	2 : 2–3
	877	„ 26	21 38·5	10·721	1·794	— ·267	— ·081	— ·093	(½) 2·17	(½) 2·16	3 : 3–4
									5012·41	2·44	
F	976	Sept. 9	21 37·8	5010·837	1·807	— ·353	— ·326	— ·365	1·97	1·93	2–3 : 2–3 faint.
	1044	Oct. 4	21 46·6	0·702	1·818	— ·456	— ·005	+ ·062	2·06	2·13	2 : 2–3
									5012·02	2·03	
J	133	Apr. 28	16 30·0	5007·527	2·805	+ ·475	+1·527	+1·335	2·33	2·14	2 : 2–3
	499	July 16	23 58·3	7·125	2·651	+ ·047	+1·622	+1·707	1·45	1·53	2 : 2
									5011·89	1·83	
C	216	Aug. 15	20 6·7	5009·303	2·980	— ·190	+ ·070	+ ·310	5012·16	2·40	
An	246	Aug. 22	20 52·5	5007·959	5·083	— ·239	— ·244	— ·380	2·56	2·42	
	256	„ 30	19 15·8	7·967	4·711	— ·293	+ ·209	+ ·078	2·60	2·46	
									5012·58	2·44	

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TABLE III.—*continued.*

Pair 162. E (8·0) and g (8·5) ; $\frac{\sigma}{\Sigma_0} = 0·889$; $\mu_s = +\ 0''·010$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	813	Aug. 19	20 59·8	5739·279	2·346	— ·302	— ·041	+ ·044	5741·28	1·37	2 : 3
F	1163	Oct. 18	21 46·9	5739·441	2·680	— ·545	— ·137	— ·018	5741·44	1·56	2–3 : 3
J	132	Apr. 28	16 21·0	5737·164	1·981	+ ·526	+1·749	+1·556	5741·47	1·23	4 : 2–3
C	60	July 9	18 50·0	5737·579	3·475	+ ·063	— ·071	— ·036	5741·05	1·08	
An	267	Aug. 30	21 28·3	5736·609	5·120	— ·381	+ ·240	+ ·391	5741·59	1·74	

Pair 163. F (8·3) and u (8·0) ; $\frac{\sigma}{\Sigma_0} = 0·975$; $\mu_s = +\ 0''·017$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
G	316	1890 June 11	16 33·4	6287·215	1·802	+ ·357	+ ·009	+ ·156	9·38	9·53	2–3 : 3
	898	Aug. 24	21 49·6	6·710	2·969	— ·356	— ·102	— ·127	(½) 9·22	(½) 9·20	3–4 : 4
									6289·35*	9·46	
F	765	Aug. 15	22 17·3	6286·850	3·450	— ·261	— ·493	— ·512	(½)6289·55	(½) 9·53	3–4 : 3–4
J	130	Apr. 28	16 3·6	6285·317	1·791	+ ·590	+1·918	+1·804	6289·62	9·50	2 : 2–3
C	148	July 22	18 15·0	6285·117	4·197	— ·025	— ·049	— ·050	9·24	9·24	
	313	Sept. 1	19 31·8	6·735	3·310	— ·405	+ ·127	+ ·322	9·77	9·96	
									6289·51	9·60	
An	282	Sept. 2	19 48·0	6285·193	4·699	— ·411	+ ·074	+ ·078	6289·56	9·56	

* 6289″·38 used.

Pair 164. f (7·6) and k (7·5) ; $\frac{\sigma}{\Sigma_0} = 0·488$; $\mu_s = +\ 0''·033$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
G	58	1889 Sept. 8	22 3·5	3149·293	0·960	— ·240	+ ·550		(½) 0·56	(½)[0·56]	3 : 3.
	164	1890 May 2	16 20·8	7·692	2·320	+ ·283	— ·080	— ·154	0·22	0·14	2–3 : 2–3
	749	Aug. 15	16 47·6	8·392	1·878	— ·149	+ ·027	— ·020	(½) 0·15	(½) 0·10	3 : 3–4
	854	,, 25	17 15·6	8·919	1·565	— ·191	+ ·088	+ ·127	(½) 0·38	(½) 0·42	2–3 : 3–4
									3150·31	0·27	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	547	July 20	15 36·3	3146·870	3·802	— ·026	— ·073	— ·112	0·57	0·53	2 : 3
	703	Aug. 9	16 15·8	7·994	2·463	— ·122	+ ·054	— ·005	0·39	0·33	2 : 2–3
									3150·48	0·43	
J	131	Apr. 28	16 12·4	3146·616	2·518	+ ·289	+ ·960	+ ·878	3150·38	0·30	2 : 2–3
C	52	July 8	18 41·8	3149·404	1·141	+ ·038	— ·073	— ·073	0·51	0·51	
	257	Aug. 24	20 34·8	8·833	1·471	— ·190	+ ·059	+ ·122	0·17	0·23	
	370	Sept. 8	21 23·4	8·426	1·927	— ·241	+ ·283	+ ·283	0·30	0·39	
									3150·33	0·38	
S	6	May 19	18 11·5	3149·119	1·025	+ ·243	— ·479	— ·425	49·91	49·96	
	126	Sept. 18	21 7·0	9·047	2·218	— ·267	— ·434	— ·473	50·56	50·53	
									3150·24	0·25	

Pair 165. p (7·7) and i (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}775$; $\mu_s = -\ 0''{\cdot}019$.

G	307	1890 June 10	22 10·7	4999·920	1·725	+ ·268	— ·054		5001·86	[1·86]	1–2 : 2–3
F	742	Aug. 14	16 29·7	4998·496	3·368	— ·220	+ ·075	+ ·116	(½)5001·72	(½) 1·76	3 : 3–4
J	128	Apr. 28	15 44·7	4995·099	5·296	+ ·459	+1·523	+1·517	5002·38	2·37	2 : 2–3
C	89	July 16	18 13·6	5000·844	1·357	+ ·013	+ ·077	— ·008	5002·30	2·21	
An	205	May 24	17 15·0	5000·377	1·389	+ ·366	+ ·245	+ ·147	5002·38	2·28	

Pair 166. e (8·4) and d (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}313$; $\mu_s = -\ 0''{\cdot}062$.

G	364	1890 June 16	17 10·1	2017·250	0·888	+ ·086	+ ·033	+ ·008	8·26	18·23	2–3 : 3
	1082	Oct. 9	21 25·2	7·285	0·726	— ·191	+ ·012	+ ·103	7·83	17·92	2 : 3
									2018·05	18·08	
F	762	Aug. 15	21 36·7	2017·634	0·732	— ·099	— ·158	— ·160	2018·11	18·11	3 : 3

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
J	127	Apr. 28	15 35·2	2015·592	1·432	+ ·184	+ ·615	+ ·629	2017·82	7·84	2 : 2–3
C	26	June 30	18 57·5	2016·651	1·154	+ ·038	— ·222	— ·178	7·62	7·66	
	245	Aug. 23	19 47·5	6·689	1·217	— ·114	— ·025	+ ·038	7·77	7·83	
									2017·69	7·74	
S	27	June 8	17 55·0	2015·750	1·972	+ ·108	— ·068	— ·135	7·76	7·70	
	143	Oct. 9	20 47·0	6·358	2·211	— ·192	+ ·006	— ·013	8·38	8·36	
									2018·07	8·03	

Pair 167. θ (8·5) and a (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}992$; $\mu_s = +\ 0''{\cdot}029$.

		1890									
G	299	June 8	17 1·6	6401·135	2·795	+ ·410	— ·006	— ·099	(½) 4·33	(½) 4·24	3 : 3–4
	578	July 22	17 5·6	1·572	2·793	— ·004	+ ·347	+ ·347	4·71	4·71	1 : 2–3
	897	Aug. 28	21 52·8	2·834	2·454	— ·362	— ·248	— ·416	4·68	4·51	2 : 2
	1080	Oct. 9	21 5·7	2·670	2·039	— ·601	+ ·039	+ ·322	4·15	4·43	2 : 3
									6404·49*	4·51	
F	576	July 21	23 24·5	6400·175	4·675	+ ·006	— ·267	— ·655	4·59	4·20	2 : 3
	1047	Oct. 4	22 23·6	2·195	2·853	— ·587	— ·006	— ·059	4·45	4·40	2 : 3
	1117	„ 12	21 39·4	2·669	2·286	— ·608	+ ·406	— ·129	4·75	4·22	2 : 3
									6404·60	4·27	
J	126	Apr. 28	15 22·7	6394·184	7·832	+ ·610	+1·950	+2·083	6404·58	4·71	
C	223	Aug. 16	19 20·4	6402·550	1·978	— ·254	+ ·188	+ ·188	4·47	4·47	
	344	Sept. 4	21 24·2	2·740	1·915	— ·405	+ ·317	+ ·456	4·57	4·71	
	409	„ 23	20 42·1	3·501	1·775	— ·532	+ ·179	+ ·179	4·93	4·93	
	422	„ 24	21 42·2	2·399	2·130	— ·545	+ ·436	+ ·565	4·43	4·56	
									6404·60	4·67	
S	57	July 10	18 32·5	6421·539	2·596	+ ·118	— ·310	— ·476	3·94	3·78	
	164	Oct. 14	20 45·5	3·298	1·764	— ·611	— ·261	— ·228	4·19	4·22	
									6404·07	4·00	

* 6404″·50 used.

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TABLE III.—*continued.*

Pair 168. z (8·5) and y (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}293$; $\mu_s = -\ 0''{\cdot}052$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	169	May 2	17 26·5	1889·802	0·638	+ ·175	— ·048	— ·032	1990·57	0·58	2 : 2
F	1196	Oct. 23	23 4·3	1889·761	1·158	— ·180	— ·018	— ·044	1990·72	0·70	3 : 3–4
J	118	Apr. 25	16 7·8	1888·722	0·691	+ ·179	+ ·663	+ ·624	1990·26	0·22	2 : 2–3
C	189	Aug. 6	18 36·2	1889·535	1·217	— ·051	+ ·026	— ·021	1990·73	0·68	
S	88	July 14	20 49·5	1888·601	1·535	+ ·021	— ·033	— ·035	1990·12	0·12	

Pair 169. y (8·2) and η (8·2) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}824$; $\mu_s = -\ 0''{\cdot}090$.

		1890									
G	305	June 10	21 42·9	5317·655	1·826	+ ·324	— ·058		19·75	[19·75]	1–2 : 2–3
	756	Aug. 15	17 48·7	8·345	2·016	— ·201	+ ·045	+ ·115	20·21	20·28	2 : 2–3
									5319·98	20·02	
F	969	Sept. 9	18 5·0	5318·399	1·865	— ·374	+ ·247	+ ·247	5320·14	20·14	1–2 : 2–3
J	119	Apr. 25	16 18·8	5313·504	3·894	+ ·505	+1·864	+1·722	5319·77	19·63	2 : 2–3
C	197	Aug. 6	21 26·0	5318·937	1·813	— ·127	+ ·074	+ ·016	20·70	20·65	
	337	Sept. 4	19 42·0	8·950	1·471	— ·343	+ ·264	+ ·181	20·34	20·26	
									5320·52	20·46	
An	237	Aug. 21	19 56·0	5318·934	1·449	— ·207	— ·140	— ·206	5320·04	19·97	

Pair 170. E (8·0) and f (7·6) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}782$; $\mu_s = +\ 0''{\cdot}012$.

		1890									
G	161	May 2	15 34·0	5040·244	1·474	+ ·454	— ·128	— ·235	2·04	1·94	2–3 : 2–3
	860	Aug. 25	20 56·4	0·732	2·107	— ·306	— ·081	— ·078	2·45	2·46	2 : 2–3
									5042·25	2·20	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
F	555	July 20	16 58·0	5040·990	1·541	— ·042	— ·117	— ·039	2·37	2·45	2 : 3
	712	Aug. 9	21 48·6	0·553	2·612	— ·197	— ·366		2·60	[2·60]	1–2 : 2 faint.
	744	„ 14	17 1·9	0·746	1·533	— ·233	+ ·076	+ ·039	(½) 2·12	(½) 2·09	3 : 3–4
									5042·41	2·44	
J	125	Apr. 28	15 4·4	5038·850	1·479	+ ·464	+1·539	+1·738	5042·33	2·53	2 : 2–3
C	47	July 6	20 19·0	5040·130	2·409	+ ·076	— ·109	— ·109	2·51	2·51	
	255	Aug. 24	20 1·1	0·295	2·510	— ·292	+ ·094	+ ·242	2·61	2·76	
	362	Sept. 7	21 31·0	0·385	2·257	— ·368	— ·031	— ·532	2·25	1·75	
									5042·46	2·34	
An	270	Sept. 1	22 4·0	4999·047	3·813	— ·349	— ·011	+ ·039	5042·50	2·55	

Pair 171. f (7·6) and h (7·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}317$; $\mu_s = -\ 0''{\cdot}006$.

G	980	1890 Sept. 10	21 41·8	2049·412	0·578	— ·159	+ ·033	+ ·057	(½)2049·86	(½) 9·89	3–4 : 3–4
F	610	July 24	22 23·9	2049·200	0·592	— ·030	— ·133	— ·087	9·63	9·68	1–2 : 3
	743	Aug. 14	16 48·4	8·694	1·248	— ·094	+ ·031	+ ·029	(½) 9·88	(½) 9·88	3 : 3–4
									2049·71	49·75	
J	92	Apr. 13	16 46·8	2047·597	1·262	+ ·194	+ ·708		2049·76	[9·76]	1–2 : 1–2
C	45	July 6	19 45·2	2048·797	0·964	+ ·025	— ·044	— ·044	2049·75	9·75	
S	7	May 19	18 22·0	2048·649	1·066	+ ·157	— ·311	— ·260	2049·56	9·61	

Pair 172. f (7·6) and d (8·4) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}624$; $\mu_s = +\ 0''{\cdot}003$.

G	163	1890 May 2	16 9·3	4026·531	3·026	+ ·361	— ·002	— ·212	9·92	9·71	2–3 : 2–3
	837	Aug. 20	21 40·7	8·487	1·168	— ·222	— ·027	— ·056	9·41	9·38	1–2 : 1–2
	1085	Oct. 9	21 52·3	8·519	1·165	— ·382	+ ·024	+ ·156	9·33	9·46	2–3 : 2–3
									4029·55	9·52	

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TABLE III.—*continued.*

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″		″		″	
F	570	July 21	21 42·5	4028·872	1·190	— ·044	— ·168	+ ·031	29·85	30·05	2 : 3
	1160	Oct. 18	21 17·4	8·667	1·179	— ·383	— ·096	+ ·075	29·37	29·50	1–2 : 2
									4029·61	29·78	
J	108	Apr. 16	17 45·8	4025·656	1·720	+ ·383	+1·365	+1·154	4029·12	28·91	2 : 2–3
C	27	June 30	19 23·4	4028·267	1·940	+ ·076	— ·443	— ·393	9·84	9·89	
	246	Aug. 23	20 0·1	7·114	2·207	— ·241	— ·050	+ ·094	9·03	9·17	
	369	Sept. 8	21 10·5	7·038	2·587	— ·342	+ ·362	+ ·362	9·99	9·99	
									4029·62	9·68	
S	112	Sept. 17	20 18·5	4027·038	3·387	— ·340	— ·491	— ·562	4029·59	9·52	
An	189	May 22	18 18·0	4026·266	2·523	+ ·297	+ ·037	+ ·137	4029·12	9·22	

Pair 173. p (7·7) and m (5·0) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}593$; $\mu_s = -\ 0''{\cdot}085$.

		1890									
G	225	May 22	16 42·1	3825·631	2·290	+ ·289	— ·146	— ·107	(½) 8·06	(½) 8·10	
	348	June 14	17 8·8	5·640	1·895	+ ·185	— ·045	— ·095	(½) 7·68	(½) 7·63	
	750	Aug. 15	16 57·7	5·899	2·054	— ·173	+ ·033	— ·018	(½) 7·81	(½) 7·76	3 : 3
	836	„ 20	21 29·8	6·899	1·154	— ·199	— ·025	— ·047	7·83	7·81	1–2 : 1–2
	983	Sept. 10	22 43·8	6·613	1·557	— ·292	+ ·061	·000	(¼) 7·94	(¼) 7·88	3–4 : 3–4
	1031	„ 29	22 39·4	6·717	1·520	— ·346	+ ·110	— ·044	8·00	7·85	2–3 : 2–3
									3827·89*	7·83	
F	549	July 20	15 54·1	3824·270	3·706	— ·023	— ·088	— ·119	7·87	7·83	2 : 3
	571	„ 21	21 53·3	6·709	1·257	— ·029	— ·160	— ·012	7·78	7·93	2 : 3
	1141	Oct. 16	21 25·4	6·894	1·108	— ·363	+ ·028	+ ·030	(½) 7·67	(½) 7·67	2–3 : 3 faint.
									3827·79	7·84	
J	106	Apr. 16	17 24·0	3824·855	1·692	+ ·363	+1·296	+1·171	3828·21	8·05	2 : 2–3
C	101	July 17	19 18·7	3826·460	1·115	— ·013	— ·059	— ·060	7·50	7·50	
	268	Aug. 27	19 40·5	6·942	1·179	— ·228	— ·089	— ·154	7·80	7·76	
									3827·65	7·63	
S	117	Sept. 17	21 42·0	3826·158	2·672	— ·316	— ·467	— ·439	3828·05	8·08	
An	206	May 24	17 27·0	3826·813	1·058	+ ·281	+ ·187	+ ·142	3828·34	8·29	

* 3827″·90 used.

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TABLE III.—*continued.*

Pair 174. p (7·7) and n (6·8) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}676$; $\mu_s = +\ 0''{\cdot}001$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
		1890	h m	″	″	″	″	″	″	″	
G	122	Apr. 26	16 28·2	4362·983	2·658	+ ·406	+ ·075	...	6·12	[6·12]	2 : 2
	224	May 22	16 32·5	3·315	2·559	+ ·331	— ·167	— ·115	6·04	6·00	(2–3 : 2–3)
	855	Aug. 25	17 26·2	4·422	2·030	— ·255	+ ·122	+ ·155	6·32	6·35	2–3 : 3–4
	1012	Sept. 26	21 26·1	5·003	1·453	— ·388	— ·144	— ·101	(½) 5·93	(½) 5·97	3 : 3
									4366·14	6·13	
F	554	July 20	16 46·6	4363·945	2·428	— ·024	— ·101	— ·051	6·25	6·30	2 : 3
	713	Aug. 9	22 3·0	4·934	1·506	— ·159	— ·316		5·96	[5·96]	1–2 : 2 ft.
	745	„ 14	17 13·7	4·029	2·138	— ·191	+ ·066	·000	(½) 6·04	(½) 5·98	3 : 3–4
									4366·09	6·10	
J	105	Apr. 16	17 9·3	4363·215	2·100	+ ·415	+1·478	+1·393	(4367·21)	(7·12)	Rejected
C	106	July 18	18 1·0	4363·885	2·270	— ·013	+ ·061	+ ·177	6·20*	6·32*	
	271	Aug. 27	20 20·5	3·289	2·587	— ·267	— ·101	— ·081	5·51	5·53	
	385	Sept. 19	20 7·0	3·251	2·549	— ·368	+ ·352	+ ·352	5·78	5·78	
	416	„ 24	20 26·9	3·519	2·764	— ·380	+ ·297	+ ·264	6·20	6·16	
									4365·92	5·95	

* Originally 106 C gave for the Resulting Distance I., 4364″·93, and II., 5″·05 ; these results were rejected and the mean values 4365″·83 and 5″·82 were used in the equations of Chap. VI. Subsequently an error in Elkin's reductions was found, leading to the result given above, which has been employed in the equations of the triangulation.

Pair 175. d (8·4) and g (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}819$; $\mu_s = +\ 0''{\cdot}030$.

G	1004	1890 Sept. 23	20 55·4	5289·094	1·607	— ·466	+ ·215	+ ·180	5290·45	90·42	2 : 2–3
F	607	July 24	21 52·9	5288·659	1·580	— ·081	— ·343	— ·164	5289·82	89·99	1–2 : 3
J	104	Apr. 16	16 53·9	5286·031	2·886	+ ·501	+1·791	+1·769	5291·21	91·19	2 : 2–3
S	35	June 20	18 34·5	5286·844	3·227	+ ·197	— ·088	— ·090	5290·18	90·18	

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TABLE III.—*continued.*

Pair 176. f (7·6) and g (8·5) ; $\frac{\sigma}{\Sigma_0} = 0{\cdot}195$; $\mu_s = + 0''{\cdot}027$.

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value. I.	Correction for Scale-value. II.	Resulting Distance. I.	Resulting Distance. II.	Definition. I. S.
			h m	″	″	″	″	″	″	″	
G	82	1889 Sept. 11	23 13·8	1260·279	0·357	— ·098	+ ·055	+ ·002	(½) 0·59	(½) 0·54	3 : 3
	1066	1890 Oct. 7	22 40·3	0·251	0·366	— ·117	— ·030	— ·059	0·47	0·44	2–3 : 2–3
									1260·51	0·47	
F	608	July 24	22 3·0	1260·025	0·377	— ·018	— ·082	— ·043	1260·30	0·34	1–2 : 3
J	117	Apr. 25	15 56·6	1259·107	1·094	+ ·116	+ ·441	+ ·425	1260·76	0·74	
C	44	July 6	19 21·1	1259·880	0·596	+ ·013	— ·027	— ·027	1260·46	0·46	
An	193	May 23	16 56·5	1259·642	0·762	+ ·092	— ·060	— ·117	1260·44	0·38	

Pair 177. p (7·7) and g (8·5) ; $\frac{\sigma}{\Sigma_0} = 1{\cdot}018$; $\mu_s = + 0''{\cdot}037$.

G	1064	1890 Oct. 7	22 24·1	6572·137	3·085	— ·614	— ·158	— ·224	6574·45	4·38	1–2 : 2
F	653	Aug. 5	15 49·7	6569·604	5·520	— ·206	+ ·056	·000	6574·97	4·92	2 : 3
J	103	Apr. 16	16 26·6	[6592·353]	3·728	+ ·622	+2·225	+2·385	[6598·93]	[9·09]	Rejected.
	116	" 25	15 11·0	6562·078	9·272	+ ·610	+2·303	+2·436	6574·26	4·39	2 : 2–3
C	70	July 11	18 51·0	6573·188	1·864	+ ·038	+ ·316	+ ·316	6575·41	5·41	
An	204	May 24	16 56·0	6572·191	2·888	+ ·480	+ ·322	+ ·122	6575·88	5·68	

Pair 178. β_1 and β_2 $\frac{\sigma}{\Sigma_0'} = 0{\cdot}043$;

G	2	1889 Sept. 1	18 34·8	279·267	·087	— ·017	+ ·020	+ ·02	279·36	9·36	
	3	"	18 40·3	279·161	·086	— ·017	+ ·020	+ ·02	279·25	9·25	

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TABLE III.—*concluded.*

Pair 179. $\frac{\sigma}{\Sigma_0} = 0{\cdot}634$

Observer.	Rotation No.	Date.	Sidereal Time.	Observed Distance.	Refraction.	Aberration.	Correction for Scale-value.		Resulting Distance.		Definition.
							I.	II.	I.	II.	I. S.
		1889	h m	″	″	″	″	″	″	″	
G	22	Sept. 3	22 26·0	4089·486	1·190	— ·261	+ ·077	+ ·066	4890·49	0·48	
	32	„ 6	18 29·2	4089·174	1·601	— ·276	+ ·124	+ ·139	4890·62	0·64	2 : 3

Pair 180. $\frac{\sigma}{\Sigma_0} = 0{\cdot}274$

G	48	1889 Sept. 8	18 6·9	1771·637	·618	— ·122	+ ·140	+ ·130	1772·27	2·26	3 : 3–4

Pair 181. $\frac{\sigma}{\Sigma_0} = 0{\cdot}308$

F	1269	1890 Nov. 14	23 22·0	1986·383	1·488	— ·178	+ ·046		1987·74		3-4 : 3

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CHAPTER IV.

Preliminary Determination of the Weights of Observations in the Triangulation.

As a preliminary method of assigning weights to the observations of the various astronomers who co-operated in the triangulation of the Victoria stars, the square of the *mean error*, in seconds of arc, of a single observation has been computed for each pair of stars by employing the usual formula :—

$$\epsilon^2 = \frac{[v\,v]}{n-1}$$

where $[v\,v]$ is the sum of the squares of the differences from the mean of the observations of the particular pair of stars, and n is the number of observations. The combining weight of each result is $= (n-1)$.

The computation has been carried out for both methods of reduction—I. and II. ; viz., I. when the scale-value is taken from the mean of the observers' measures of the Standard stars on the same night, and II. when the scale-value is interpolated between the measures of the Standard stars on the same night. (See Chap. I., § 9.) The results may be briefly summarized as follows :—

Cape Heliometer.—Observer Gill.

—		ϵ^2 I.	ϵ^2 II.	Number of Pairs.	Weight.	Mean Distance.
Fainter Star's Magnitude	6·8 to 7·8	·0262	·0302	26	47	4400″
	7·9 to 8·2	·0522	·0580	42	75	5000
	8·3 to 8·5	·0479	·0374	44	74	4800
Distance	0″ to 3000″	·0161	·0172	16	22	1900
	3000 to 5000	·0364	·0338	44	77	3900
	5000 to 7200	·0571	·0573	52	97	6250

Cape Heliometer.—Observer Finlay.

Fainter Star's Magnitude	6·8 to 7·8	·0500	·0499	20	26	4250″
	7·9 to 8·2	·0408	·0480	21	33	5050
	8·3 to 8·5	·0508	·0495	28	38	5150
Distance	0″ to 3000″	·0145	·0359	6	7	1900
	3000 to 5000	·0393	·0494	36	51	4350
	5000 to 7200	·0677	·0605	32	48	6100

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In the case of Jacoby's observations at the Cape, it is impossible to arrive at any conclusions as to their weight in this way, because he observed only 4 pairs more than once. An approximate estimate of the weight of his observations will be afterwards formed.

YALE HELIOMETER.—Observer CHASE.

——		ϵ^2 I.	ϵ^2 II.	Number of Pairs.	Weight.	Mean Distance.
Fainter Star's Magnitude	6·8 to 7·8	·0914	·1338	23	31	4270″
	8·0 to 8·2	·0874	·1019	36	46	4580
	8·3 to 8·5	·1895	·1890	38	60	4750
Distance	0″ to 3000″	·0599	·0614	14	17	2010
	3000 to 5000	·1518	·1507	44	62	3930
	5000 to 7200	·1326	·1688	39	58	6040

GÖTTINGEN HELIOMETER.—Observers SCHUR and AMBRONN.

Fainter Star's Magnitude	6·8 to 7·8	·0903	·1057	8	8	4890″
	8·0 to 8·2	·0593	·0685	13	13	4300
	8·3 to 8·5	·0900	·0977	27	27	4330
Distance	0″ to 3000″	·0397	·0389	7	7	1480
	3000 to 5000	·0984	·0966	25	25	3940
	5000 to 7200	·0781	·1085	18	18	6230

It was necessary, in order to get a sufficient number of pairs observed twice, to regard the observations of Schur and Ambronn as identical. Subsequent comparisons shew that there may be small systematic differences between the observers, and thus the resulting accidental error is somewhat larger than it would have been, had it been possible to consider the observations of Drs. Schur and Ambronn separately.

It should also be remarked that, in the Cape Heliometer observations, when the images are 3 or the steadiness 3–4, half weight only is given to the observation, as the result of previous experience, and weight $\frac{1}{4}$ only when the images are 3–4 or steadiness 4. There is no doubt that this practice has tended to diminish the mean error of an observation of weight = 1. In the absence of full information on the quality of the definition at the other Observatories, it was only possible to allow weights smaller than unity in those cases in which the observer noted peculiarly unfavourable conditions.

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It appears from the above results that the two methods of reduction are sensibly of the same accuracy; in some cases method I. seems the better, in other cases method II. But, on the whole, the result from the mean of the two methods agrees better with the mean result of all the observers than does one only, and, therefore, the mean of the two methods of reduction has been adopted as definitive.

Mr. Finlay appears to observe stars of all magnitudes with equal accuracy, and the same seems to be the case for the Göttingen observers.

Dr. Gill observes stars as bright or brighter than the Standard stars with decidedly higher accuracy than stars of magnitude 8·0 to 8·2; but his observations of stars of 8·3 to 8·5 magnitude are rather more accurate than those of 8·0 to 8·3 magnitude; this fact is probably explained by his habit of observing the faintest stars only on the finest nights. This latter difference of accuracy is not sufficiently marked to demand a separate classification, and his observations are accordingly weighted in two classes, viz., pairs in which the fainter component is brighter than 7·9 magnitude, and pairs in which the fainter component is less bright than 7·9 magnitude.* The observations of Mr. Chase at Yale seem to be equally accurate for all stars brighter than magnitude 8·3, but much less accurate for stars of magnitude 8·3 to 8·5; his observations are thus weighted in two classes.

All the observers measure the shortest distances with smaller accidental error than the longer ones, and in Gill and Finlay's observations the value of ϵ^2 increases almost exactly with the distance. In the Yale and Göttingen observations this law is not well marked, but the rejection of two or three abnormally large errors in the pairs of distance 3000″ to 5000″ would render the accordance with the law nearly complete. I have endeavoured to deduce the values of ϵ^2 for different distances, at the same time to represent as exactly as possible all the combinations of the values of ϵ^2 which could be advantageously made.

Distance.	Gill.		Finlay.	Chase.		Göttingen.
	Mag. 6·8 to 7·8.	Mag. 7·9 to 8·5.	All Stars.	Mag. 6·8 to 8·2.	Mag. 8·3 to 8·5.	All Stars.
	ϵ^2	ϵ^2	ϵ^2	ϵ^2	ϵ^2	ϵ^2
1000″	·010	·013	·018	·050	·100	·034
2000	·014	·021	·025	·064	·125	·047
3000	·020	·029	·032	·077	·150	·064
4000	·028	·040	·041	·090	·175	·082
5000	·034	·050	·051	·108	·190	·098
6000	·039	·060	·063	·123	·205	·110
7000	·043	·070	·077	·130	·217	·126

* The original comparison of the observations Gill—Finlay was made with three classifications of weights, as given in the beginning of next chapter.

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If we give weight = 1 for an observation whose *mean error* is :—

$$\epsilon = \pm\ 0''{\cdot}20$$

the corresponding weights of the different classes of observation become :—

Distance.	Gill.		Finlay.	Chase.		Göttingen.
	Mag. 6·8 to 7·8.	Mag. 7·9 to 8·5.	All Stars.	Mag. 6·8 to 8·2.	Mag. 8·3 to 8·5.	All Stars.
1000′	p 4·00	p 3·08	p 2·22	p 0·80	p 0·40	p 1·18
2000	2·86	1·90	1·60	0·62	0·32	0·85
3000	2·00	1·38	1·25	0·52	0·27	0·63
4000	1·43	1·00	0·98	0·44	0·23	0·49
5000	1·18	0·80	0·78	0·37	0·21	0·41
6000	1·03	0·67	0·64	0·33	0·20	0·36
7000	0·93	0·57	0·52	0·31	0·18	0·32

These weights are probably on the whole somewhat too great, on account of small systematic differences depending on the colour and magnitude of stars and other causes which cannot be completely determined. On this account, and because of the larger number of observations made with the Cape Heliometer, the weights of the Cape observers have been diminished one third, and the following preliminary system of weights has been adopted :—

TABLE IV.

Distance.	Gill.		Finlay.	Jacoby.	Chase.		Göttingen.
	Mag. 6·8 to 7·9.	Mag. 8·0 to 8·5.	All Stars.	All Stars.	Mag. 6·8 to 8·2.	Mag. 8·3 to 8·5.	All Stars.
600′	p 3·1	p 2·4	p 1·8	p ...	p ...	p ...	p ...
1000	2·7	2·0	1·5	0·5	0·8	0·4	1·2
2000	2·0	1·3	1·1	0·4	0·6	0·3	0·9
3000	1·3	0·9	0·9	0·3	0·5	0·3	0·6
4000	1·0	0·7	0·7	0·3	0·4	0·2	0·5
5000	0·8	0·6	0·6	0·2	0·4	0·2	0·4
6000	0·7	0·5	0·5	0·2	0·3	0·2	0·4
7000	0·6	0·4	0·4	0·2	0·3	0·2	0·3

The weights adopted for Mr. Jacoby's observations are founded on an estimate somewhat crudely formed from the agreement of his observations with the general means, viz., that they are entitled to about one-third the weight of Mr. Finlay's observations.

The above preliminary system of weights will, however, only be employed in determining the general correction for scale-value (after all the observations have been reduced to a common system), and the definitive outstanding errors, depending on magnitude, of the Right Ascensions derived by Dr. Auwers from the meridian observations.

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CHAPTER V.

Preliminary Results of the Meridian and Heliometer Observations.

The results of the Meridian observations of the comparison stars made at 22 different Observatories, as discussed by Dr. Auwers, are given in the following Table V.

The columns 1 to 7 on the left-hand page are sufficiently explained by their headings, as also are columns 8, 9 and 12 on the right-hand page.

Columns 10, 13 and 15 give the weights of α, δ and μ respectively as derived by Dr. Auwers. In his system of weights *unity* corresponds with an estimated *mean error* of $\pm\ 0^s{\cdot}0316\ (=\sqrt{0{\cdot}001})$ for the Right Ascensions, and $\pm\ 0''{\cdot}316\ (=\sqrt{0{\cdot}1})$ for the Declinations. From data furnished by Dr. Auwers, his weight 1 in the proper motions has been assumed to correspond with a mean error of $\pm\ 0''{\cdot}25$ (or more exactly with $\sqrt{0{\cdot}06}$).

For subsequent convenience the squares of the mean errors (expressed in seconds of arc on the great circle) corresponding to Auwers' weights, are given for the Right Ascension, Declination and proper motion in columns 11, 14 and 16 respectively.

In all subsequent computations throughout this work the system of weights is based on weight unity for an estimated *mean error* of $\pm\ 0''{\cdot}20$. The weights of the Right Ascensions and Declinations computed on this basis are given in columns 17 and 18.

The adopted tabular places of the auxiliary stars E and F are for 1889·0.

	α			δ		
	°	′	″	°	′	″
E	292	37	30·67	− 6	12	53·91
F	296	51	35·47	− 6	17	25·62

These places are derived from 4 meridian observations of each star made at the Cape in 1890, and they have been employed only to compute the tabular position angles and distances with sufficient accuracy for forming the equations of condition from the solution of which the ultimate corrections of the star places are to be derived.

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Equinox 1889·0. TABLE V.—RESULTS OF DR. AUWERS' DISCUSSION OF THE

Star.		Right Ascension.		Declination.	Proper Motion.	
Name.	Magnitude.	Time.	Arc.		μ	μ^1
		h m s	° ′ ″	° ′ ″	s	″
a	7·8	19 21 25·194	290 21 17·92	− 5 57 20·84	− 0·0006	− 0·010
b	8·2	19 23 2·489	290 45 37·33	6 24 0·60	− 0·0012	+ 0·003
c	8·5	19 24 6·221	291 1 33·32	5 9 5·85	− 0·0036	+ 0·016
d	8·4	19 25 17·926	291 19 28·89	5 54 12·52	− 0·0004	− 0·008
e	8·3	19 25 40·295	291 25 4·42	5 21 2·32	− 0·0038	− 0·062
f	7·5	19 27 50·497	291 57 37·45	− 4 58 48·97	− 0·0012	+ 0·004
g	8·5	19 28 37·614	292 9 24·21	4 41 23·31	+ 0·0010	+ 0·015
h	7·8	19 29 20·726	292 20 10·89	4 33 5·40	− 0·0005	− 0·013
i	7·7	19 30 41·135	292 40 17·02	5 1 2·44	− 0·0030	+ 0·01*
k	7·9	19 30 53·378	292 43 20·67	4 32 43·42	+ 0·0024	− 0·024
l	8·0	19 31 22·122	292 50 31·83	− 3 43 18·91	− 0·001	− 0·02*
m	5·7	19 31 53·998	292 58 29·98	4 53 40·04	+ 0·0056	− 0·045
n	6·6	19 34 26·885	293 36 43·27	5 42 7·32	− 0·0007	0·000
o	7·6	19 34 53·506	293 43 22·59	4 17 21·08	+ 0·0012	+ 0·014
p	7·6	19 35 56·007	293 59 0·10	4 32 49·36	− 0·0014	+ 0·004
q	8·4	19 39 23·662	294 50 54·93	− 4 47 22·36	− 0·0010	+ 0·007
r	7·9	19 40 59·489	295 14 52·33	3 56 0·53	+ 0·0001	0·000
s	7·9	19 41 53·287	295 28 19·30	5 30 22·58	− 0·0011	+ 0·014
t	7·9	19 43 4·464	295 46 6·96	4 46 18·29	− 0·0007	− 0·016
u	8·0	19 43 43·818	295 55 57·27	4 48 25·29	− 0·0025	− 0·004
v	6·7	19 44 56·185	296 14 2·77	− 4 58 27·05	− 0·0002	− 0·004
w	8·2	19 47 27·179	296 51 47·68	4 51 32·34	− 0·0032	+ 0·015
x	8·1	19 48 22·372	297 5 35·58	5 19 59·88	+ 0·0033	+ 0·011
y	8·1	19 51 25·870	297 51 28·05	4 58 53·87	+ 0·0021	− 0·045
z	8·5	19 52 3·487	298 0 52·30	5 28 58·92	− 0·001	+ 0·1*
α	8·0	19 52 18·108	298 4 31·62	− 6 38 55·72	− 0·0036	− 0·001
β	8·0	19 52 38·022	298 9 30·33	4 39 16·25	− 0·0029	+ 0·035
γ	7·4	19 54 57·302	298 44 19·53	4 36 52·20	− 0·0003	− 0·023
δ	8·3	19 55 39·739	298 54 56·08	6 40 49·02	− 0·0022	+ 0·021
ε	6·6	19 56 17·662	299 4 24·94	5 17 48·66	+ 0·0011	− 0·025
ζ	8·0	19 57 4·778	299 16 11·67	− 8 0 14·29	0·00	− 0·1
η	8·1	19 57 21·732	299 20 25·98	4 56 27·96	− 0·0041	+ 0·017
θ	8·4	19 59 23·790	299 50 56·85	6 53 57·40	− 0·0021	− 0·053
ι	7·0	20 0 44·850	300 11 12·75	4 44 4·03	+ 0·0021	− 0·006
κ	7·5	20 1 3·690	300 15 55·35	8 29 59·13	+ 0·0014	− 0·022
λ	8·1	20 2 45·803	300 41 27·04	7 20 32·97	− 0·0017	− 0·020
μ	6·5	20 5 8·924	301 17 13·86	− 9 10 12·58	+ 0·0001	0·000

* The proper motions of *i*, *l*, and *z*, have been neglected in the subsequent computations, or rather have been regarded = 0, with probable errors corresponding to the attached weights.

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MERIDIAN OBSERVATIONS OF THE COMPARISON STARS. Epoch 1889·55.

Star.	Right Ascension.			Declination.			Proper Motion.		Weight when w = 1 for ε = ± ·20″	
	No. of Obs.	Weight (Auwers.)	εε (Sec. of arc on great circle).	No. of Obs.	Weight (Auwers.)	εε (Sec. of arc.)	Weight (Auwers.)	εε (Sec. of arc on great circle).	α	δ
a	96	35·9	·0062	96	20·7	·0048	152	·0004	6·4	8·3
b	90	25·9	86	95	20·2	49	114	5	4·6	8·1
c	90	24·9	90	90	19·6	51	60	10	4·4	7·8
d	118	37·8	59	117	23·1	43	64	9	6·8	9·2
e	121	38·3	58	118	22·9	44	79	7	6·9	9·2
f	136	37·7	·0059	134	21·7	·0046	194	·0003	6·8	8·7
g	86	32·2	69	89	20·1	50	51	12	5·8	8·0
h	64	26·5	85	64	15·3	65	186	3	4·7	6·1
i	84	29·3	76	85	18·3	55	11	54	5·3	7·3
k	90	31·8	70	91	20·2	49	66	9	5·7	8·1
l	63	24·7	·0090	63	15·6	·0064	16	·0036	4·4	6·2
m	107	37·0	61	112	23·2	43	712	1	6·6	9·3
n	87	30·1	74	88	19·5	51	193	3	5·4	7·8
o	67	25·0	90	68	16·7	60	56	10	4·4	6·7
p	234	54·4	41	235	31·2	32	199	3	9·8	12·5
q	143	45·6	·0049	142	27·4	·0036	198	·0003	8·2	11·0
r	89	31·4	70	87	18·8	53	182	3	5·7	7·5
s	73	29·0	77	73	17·4	57	136	4	5·2	7·0
t	234	54·0	41	234	32·2	31	191	3	9·8	12·9
u	75	29·0	77	76	18·1	55	156	4	5·2	7·2
v	92	35·2	·0064	92	20·2	·0049	307	·0002	6·3	8·1
w	137	43·9	50	137	26·0	38	53	11	7·9	10·4
x	132	42·3	53	131	25·9	39	99	6	7·5	10·4
y	119	39·1	58	115	23·5	42	69	8	6·9	9·4
z	116	35·1	64	114	21·9	46	18	33	6·3	8·8
α	60	24·2	·0092	67	15·7	·0064	125	·0005	4·3	6·3
β	59	26·2	85	63	14·7	68	137	4	4·7	5·9
γ	88	33·2	67	90	20·6	48	248	2	5·9	8·2
δ	95	33·8	66	96	20·2	49	101	6	6·1	8·1
ε	92	30·8	72	91	18·1	55	151	4	5·5	7·2
ζ	73	28·3	·0079	72	17·0	·0059	25	·0024	5·0	6·8
η	81	31·0	72	79	17·7	56	129	3	5·5	7·1
θ	89	32·0	69	88	19·1	52	426	1	5·8	7·6
ι	71	26·3	85	66	16·1	62	189	3	4·7	6·4
κ	70	24·2	92	70	15·4	65	173	3	4·3	6·2
λ	65	23·6	94	64	11·9	84	117	5	4·2	4·7
μ	180	47·1	·0048	179	28·4	·0035	463	·0001	8·4	11·4

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The following Table VI. gives the mean result of the observation of each pair of stars by each observer as derived from the data of Table III., Chap. III., and the corresponding tabular distance and position angle computed from the data of Table V.

Each observed result is corrected for proper motion to 1889·55.

The weights given in the columns marked p' are computed on the preliminary system of weights given in Table IV., Chap. IV.

The tabular distances have been computed by the rigorous formula :—

$$\sin \tfrac{1}{2} s \cos p_0 = \sin \tfrac{1}{2} (\delta' - \delta) \cos \tfrac{1}{2} (\alpha' - \alpha)$$

$$\sin \tfrac{1}{2} s \overset{\sin}{\cancel{\cos}} p_0 = \cos \tfrac{1}{2} (\delta' + \delta) \sin \tfrac{1}{2} (\alpha' - \alpha)$$

where

α and δ are respectively the R.A. and Dec. of the star of origin of the position angle,

α' ,, δ' ,, ,, ,, ,, other star,

and p_0 is the mean of the position angles at the two stars.

The Heliometer observations of position angle do not represent p_0, but p, the position angle at the middle point between the stars, and the correction

$$- \tfrac{1}{16} s^2 \sin 1'' \sin 2p \, (1 + 2 \tan^2 \delta)$$

is required to reduce p_0 to p. This correction is quite insensible for our present purposes, but it is of course taken into account in a subsequent chapter dealing with observations of position angle.

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ANNALS OF THE CAPE OBSERVATORY—Vol. VI.

ADDITIONAL ERRATUM.

TRIANGULATION OF THE VICTORIA STARS, PART I.,

Page 118. *For* $\sin \frac{1}{2} s \cos p_0 = \cos \frac{1}{2} (\delta' + \delta) \sin \frac{1}{2} (\alpha' - \alpha)$, *read* $\sin \frac{1}{2} s \sin p_0 = \cos \frac{1}{2} (\delta' + \delta) \sin \frac{1}{2} (\alpha - \alpha)$.

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TABLE VI.

GIVING THE OBSERVED HELIOMETER DISTANCES CORRECTED FOR PROPER MOTION TO 1889·55, AND THE TABULAR DISTANCES COMPUTED FROM THE CO-ORDINATES DERIVED BY DR. AUWERS FROM THE MERIDIAN OBSERVATIONS.

Rotation No.	Stars.	Observed Distances.												Tabular Quantities.	
		Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.		Distance.	Position Angle.
		″	p′	″	p′	″	p′	″	p′	″	p′	″	p′	″	° ′
1	fn	4·59	1·4	5·20	0·9	6·12	0·2	4·92	0·9	4·92	0·4			6465·092	293 42
2	fc	7·10	1·7	7·36	0·8			6·64	0·3					3407·296	259 34
3	ps	7·72	1·4	8·25	1·0			8·06	0·6	7·83	0·4	8·61	0·4	6358·031	122 54
4	pl	1·07	0·6	1·02	0·6			1·51	0·4			1·25	0·4	5060·977	305 56
5	qo	2·78	1·0	3·00	0·9			2·90	0·4	2·95	0·5			4423·018	114 2
6	qt	1·10	2·0	1·12	2·0			1·11	0·9	0·90	1·2			3301·129	268 53
7	ec	7·39	3·6	7·24	1·3			7·23	0·7	7·35	2·0			1577·292	297 0
8	eE	7·09	2·1	7·05	1·2			7·24	0·6			7·32	0·4	5327·258	305 44
9	da	7·41	1·6	7·42	1·6			7·58	1·0	7·52	1·1			3477·397	86 54
10	dE	8·72	1·8	8·83	1·2	9·08	0·2	8·57	0·6			8·55	0·4	4788·766	283 32
11	tr	9·59	1·7	9·73	2·8			9·66	1·2	9·55	1·1			3549·761	148 14
12	tF	1·43	0·9	1·28	0·9			1·95	0·4			1·31	0·4	6721·643	324 25
13	θη	0·76	0·8	0·78	0·6					0·63	0·6			7280·851	165 31
14	θκ	0·27	1·0	0·14	0·8					0·96	0·8			5950·003	345 33
15	λθ	4·35	1·6	3·92	1·2					4·13	1·1			3403·931	297 57
16	λκ	3·84	2·6	4·01	2·0			4·20	0·8	4·12	0·4			4433·770	20 0
17	mk	9·26	4·7	9·49	2·6			9·23	1·4	9·20	2·1			1549·302	324 12
18	mn	6·85	2·2	6·60	1·6			6·40	0·9	7·04	1·1			3696·833	141 51
19	zx	5·89	1·0	5·68	1·6			5·65	0·9	5·26	1·1			3345·672	99 16
20	zε	4·37	1·2	4·53	1·2			4·56	0·5	4·47	1·1			3854·494	259 59
21	xs	3·45	0·8	3·82	0·8			3·90	0·7			3·72	0·4	5843·450	83 53
22	xε	99·91	1·2	100·17	0·9							9·92	0·6	7099·915	268 56
23	kl	5·49	0·9	5·74	0·9	5·78	0·3	5·32	0·5			5·84	0·6	2995·541	8 15
24	ki	8·84	2·3	8·78	1·3	9·10	0·4	8·75	0·7			8·95	1·0	1708·852	6 9
25	yx	9·37	0·9	9·67	0·9	9·54	0·3	9·31	0·5			9·56	0·6	3019·536	65 13
26	yγ	5·68	0·8	6·20	0·8	6·26	0·3	6·23	0·5			5·35	0·6	3425·596	247 18
27	δγ														
28	δζ	0·49	0·9	0·58	0·6			0·79	0·4					4930·339	345 8
29	εγ	4·22	1·2	4·16	0·3	3·86	0·3					4·11	0·7	2734·283	333 57
30	εθ	1·94	0·9	1·91	0·9			1·99	0·4	2·02	0·7			6401·931	154 18
31	ζα	80·00	2·0	79·85	0·9			0·20	0·6			0·13	0·4	6479·910	138 50
32	ζκ	70·37	3·2	0·39	2·1			0·70	0·8			0·28	1·0	3970·365	296 43
33	gc	3·24	0·3	3·42	0·7	3·53	0·3	3·48	0·3					4383·393	67 42
34	gk	5·42	1·3	5·38	1·1	5·61	0·4	5·49	0·3			5·13	0·9	2095·371	255 38
35	Eb	6·17	0·8	6·33	0·4			6·57	0·6			6·37	0·3	6705·909	84 18
36	En	6·43	1·4	6·41	1·1	6·49	0·3	6·22	1·2			6·33	0·5	3986·827	242 25
37	Fs	5·44	3·3	5·61	1·4			5·64	0·8			5·15	0·4	5715·522	119 36

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TABLE VI.—*continued.*

Rotation No.	Stars.	Observed Distances.												Tabular Quantities.	
		Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.		Distance.	Position Angle.
		″	p′	″	p′	″	p′	″	p′	″	p′	″	p′	″	° ′
38	F α	5·78	2·6	5·74	1·4			5·97	0·8			6·04	0·5	4535·620	286 31
39	s n	1·48	2·7	1·87	0·3			1·20	0·9	1·35	0·3			6701·177	83 58
40	s w	5·64	1·1	6·01	0·7			5·54	0·4			5·88	0·4	5505·353	64 57
41	r o	3·79	1·1	3·77	0·7			3·77	0·7	3·41	0·4			5623·352	76 50
42	r w	7·24	0·7	7·65	0·5			7·39	0·9			7·40	0·3	6687·288	119 53
43	γ β	7·25	1·3	7·64	1·1	7·13	0·4	7·11	0·6			7·88	0·9	2087·346	266 2
44	γ η	7·98	1·1	7·93	1·0	8·07	0·4	8·05	0·6			8·35	0·8	2458·318	118 34
45	w β	4·88	0·8	4·60	0·6			4·37	0·8			4·60	0·4	4704·525	261 0
46	w v	4·53	1·8	4·34	1·1			4·32	1·1			4·65	0·8	2294·367	79 35
47	n i	6·34	2·0	6·31	0·4			6·45	0·4			6·07	0·5	4176·380	306 10
48	n o	1·46	1·0	1·88	0·9			1·19	0·8			2·22	0·4	5101·777	4 28
49	i h	3·14	5·0	3·53	0·5			3·92	0·6			3·21	0·9	2063·271	324 23
50	b c	4·54	1·3	4·33	1·3			4·32	0·4			4·37	0·4	4594·281	11 57
51	b a	9·54	3·6	9·36	1·1			9·17	1·2			9·54	0·9	2159·737	137 48
52	f i	3·45	1·6	3·14	1·0	3·21	0·4	2·84	0·5	2·81	0·7			2553·325	93 0
53	f a	0·35	1·9	0·52	0·4			0·16	0·6			1·13	0·3	6740·331	238 36
54	p q	4·86	3·5	5·29	0·9			4·92	0·9	4·84	0·6	5·32	0·6	3224·901	105 42
55	p k	5·07	0·9	5·44	0·6	5·20	0·5	4·99	0·8	5·11	0·5	4·64	0·5	4525·154	270 4
56	q s	3·72	2·4	3·91	1·2	3·60	0·3	4·00	0·9	3·78	0·5	4·31	0·5	3413·812	319 6
57	q r	8·50	2·4	8·71	1·3	8·84	0·3	9·12	1·4	8·86	1·1			3398·801	204 56
58	e i	1·78	1·0	1·41	0·6	1·01	0·2	1·39	0·2	1·30	0·4			4651·552	255 3
59	e a	7·22	0·7	7·65	0·4	6·89	0·3	6·92	0·4	6·69	0·5			4387·016	60 14
60	d m	0·76	1·2	0·93	0·4	0·77	0·2	1·25	0·6	1·21	0·6			6941·040	238 27
61	d b	7·68	1·0	7·72	1·0	7·02	0·3	7·71	0·6	7·56	1·2			2697·599	48 29
62	t v	1·70	3·2	1·95	1·2	1·48	0·4	1·70	1·3	1·77	1·9			1821·859	293 35
63	t s	0·06	3·5	9·77	1·5	9·54	0·3	0·20	1·6	0·05	0·7			2850·084	21 54
64	θ δ	9·18	1·6	8·96	0·8	8·79	0·3	8·79	0·5	8·96	1·1			3429·051	103 18
65	θ ζ	2·32	1·3			2·21	0·3	2·65	0·4	2·68	0·9			4482·223	27 28
66	λ μ	4·04	1·6	4·13	0·6	4·95	0·2	3·53	0·9	4·64	0·6			6914·090	342 6
67	λ ζ	1·07	2·8	1·22	1·0			1·58	0·7	1·57	0·8			5600·973	64 50
68	m o	6·92	1·2	7·26	0·8	6·60	0·3	7·23	0·5	6·88	0·6			3457·095	50 56
69	m i	5·28	3·2	5·08	1·4			4·82	0·8	4·87	1·2			1175·307	247 53
70	μ κ	3·03	4·9	2·81	0·9	2·80	0·3	2·69	1·2	3·13	0·9			4363·119	30 35
71	κ α	2·53	2·0	2·61	0·9			2·58	0·4	2·63	1·0			4202·462	357 2
72	κ w	9·63	1·3	9·69	1·3			9·54	0·4	9·58	0·9			4699·496	118 33
73	ϰ α	8·74	1·0	8·71	0·5	9·06	0·2	9·12	0·6					5898·732	323 24
74	ϰ w	6·27	2·7	6·14	1·4			6·02	1·2			5·85	1·8	1896·223	334 13
75	k n	5·38	0·2	5·18	0·6	5·19	0·2	5·53	0·4			5·32	0·4	5245·251	322 33
76	k h	5·36	2·3	5·55	1·3	5·61	0·5	5·57	1·4			5·42	1·1	1385·578	89 6
77	y α	2·38	0·8	2·45	0·5			2·30	0·3			2·78	0·4	6052·258	352 36
78	y β	6·55	1·6	6·87	1·3	6·55	0·4	6·48	0·7			6·89	1·0	1596·833	222 29
79	δ η	3·74	0·7	3·83	0·5			3·69	0·2			4·11	0·4	6443·391	193 40

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TABLE VI.—*continued.*

Rotation No.	Stars.	Observed Distances.												Tabular Quantities.	
		Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.		Distance.	Position Angle.
		″	p′	″	p′	″	p′	″	p′	″	p′	″	p′	″	° ′
80	δ a	6·03	1·8	5·87	0·9	6·39	0·3	5·85	0·6			6·08	0·6	3006·163	92 10
81	ε ι	6·90	0·5	6·91	1·0	7·45	0·3	6·63	0·8			6·48	0·5	4476·465	63 7
82	ε β	4·83	0·9	4·58	0·7			4·97	0·4			5·04	0·5	4014·961	305 10
83	g n	4·09	0·6	4·14	0·5			4·75	0·2			4·68	0·4	6364·030	304 56
84	g l	5·56	1·1	5·15	0·7			5·43	0·2			6·07	0·5	4265·829	215 14
85	E m	5·91	1·8	5·62	1·2	5·81	0·2	5·54	1·2			6·04	0·4	4916·320	194 46
86	E c	0·04	0·6	9·85	0·5			0·29	0·4			9·95	0·3	6890·211	123 45
87	F x	4·17	0·9	4·43	0·6	3·91	0·2	4·31	0·4			4·63	0·4	5054·314	234 54
88	F v	2·03	1·2	1·93	0·9			2·09	0·4			2·22	0·4	5242·093	154 41
89	s v	6·48	2·4	6·15	1·2			6·16	0·9	6·62	0·6			3336·623	234 58
90	s r	8·83	1·5	8·48	0·8			8·92	0·7	8·27	0·4			5718·876	171 55
91	γ w	6·07	0·8	6·21	0·4	6·76	0·2	5·95	0·6			6·13	0·3	6786·096	262 33
92	n h	1·01	0·7	0·28	0·5	0·78	0·2	0·95	0·3			0·72	0·4	6170·604	312 10
93	a c	2·90	1·5	2·93	0·7	2·83	0·3	3·12	0·6			3·30	0·5	3763·035	319 43
94	v u	7·59	3·5	7·69	1·4	7·39	0·5	7·59	1·5			7·53	1·1	1237·682	299 6
95	f m	1·85	5·0	1·97	3·1	1·99	0·6	1·81	1·3	2·03	0·5			3652·058	265 9
96	f l	5·79	1·1	6·11	0·5			6·07	0·3			6·49	0·4	5526·276	34 56
97	p u	6·49	0·4	5·99	0·4	5·99	0·1					6·31	0·3	7056·139	97 37
98	p o	7·31	5·0	7·31	1·4	7·11	0·5	7·37	1·5	7·35	1·1	7·39	1·1	1317·355	134 48
99	q v	3·73	2·4	4·07	2·1	3·79	0·2	3·96	0·6	3·97	0·4	3·56	0·4	5014·000	277 37
100	q m	1·66	1·7	1·79	1·5	1·60	0·2	1·95	0·8	1·84	0·6			6731·484	86 47
101	e k	4·18	1·1	4·18	0·5			4·15	0·4	3·71	0·4			5503·988	238 13
102	e b	2·02	0·7	1·61	0·7	1·77	0·3	1·89	0·4	1·81	0·4			4451·930	31 56
103	d i	5·28	0·5	5·59	0·5	5·08	0·2			5·20	0·4			5785·125	236 32
104	b x	2·51	1·2	2·32	0·6	3·14	0·2	2·52	0·8	2·41	0·8			5162·360	113 3
105	λ δ	6·46	1·9	6·53	0·7	6·58	0·2	7·00	0·4	6·12	0·6			6776·318	290 36
106	m l	7·72	0·7	7·90	0·7	8·18	0·2	8·34	0·4	8·09	0·5			4247·975	353 33
107	z δ	3·14	1·1	3·59	0·6	3·51	0·2	3·55	0·2					5383·358	323 11
108	z γ	4·44	0·7	4·61	0·7	4·51	0·3	5·19	0·2	4·70	0·5			4064·627	219 43
109	α γ	4·23	0·5	4·04	0·5	3·78	0·3	3·89	0·3			4·44	0·4	6443·985	246 19
110	k o	7·62	1·7	7·22	0·4	7·41	0·3	7·37	0·4	7·62	0·5	7·69	0·5	3707·769	255 35
111	y δ	3·16	0·4	3·67	0·4	2·89	0·2							7193·426	148 13
112	y w	3·99	0·8	3·98	0·8	4·67	0·3	4·26	0·4			4·29	0·5	3594·388	277 4
113	δ e														
114															
115	g i	0·91	1·2	0·70	1·1	0·45	0·4	0·79	0·3			0·64	0·8	2190·593	302 34
116	E i	4·13	0·7	4·01	0·7	3·88	0·3	4·45	0·4			4·64	0·5	4314·644	182 12
117	F α	4·98	0·8	5·16	1·2	4·98	0·3	5·52	0·5			5·95	0·6	3545·650	193 38
118	s u	0·50	1·8	0·57	0·9	0·65	0·3	0·59	1·0	0·56	0·6			3010·537	33 15
119	r v	4·07	1·6	3·64	0·6	5·18	0·2	4·24	0·8			4·03	0·4	5154·185	316 37
120	w u	3·81	1·7	4·32	0·4	3·70	0·3	3·78	0·9			4·00	0·6	3343·739	93 12
121															

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TABLE VI.—*continued.*

Rotation No.	Stars.	Observed Distances.												Tabular Quantities.	
		Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.		Distance.	Position Angle.
		″	p′	″	p′	″	p′	″	p′	″	p′	″	p′	″	° ′
122	f e	8·37	4·1	8·25	1·5	8·26	0·4	8·39	0·9			8·47	0·8	2358·220	235 34
123	t p														
124	q w	1·39	1·6	1·25	0·4	1·59	0·2			1·87	0·3	1·88	0·3	7231·382	271 59
125	e h	3·64	0·7	3·51	0·7	3·66	0·3	3·61	0·2	3·97	0·5			4373·525	228 52
126	d k	0·79	0·4	0·77	0·4	0·81	0·2	1·31	0·2	0·42	0·3			7000·780	225 42
127	t w	9·30	1·1	9·79	0·7	9·29	0·3	9·34	0·8	9·44	1·0			3939·354	94 34
128	m g	6·48	0·5	6·88	0·9	6·66	0·3	6·29	0·3	5·97	0·6			3026·510	284 5
129	z β	6·60	0·9	7·07	0·9	6·35	0·3	7·22	0·3	7·20	0·6			3026·981	189 49
130	æ β	4·58	0·6	4·61	0·6	4·93	0·2	4·87	0·4			5·15	0·4	4534·865	237 24
131	k c	4·77	0·3	4·88	0·5			4·70	0·2			4·85	0·4	6464·970	250 16
132	y v	3·32	0·8	3·66	0·2	3·71	0·2	3·36	0·6					5823·286	90 16
133	ε η	8·89	1·6	8·61	1·3	8·71	0·4	8·82	0·7			8·92	1·0	1598·886	36 46
134	g o	3·06	0·5	3·19	0·5	3·24	0·2	3·17	0·2			3·24	0·4	5803·141	255 37
135	E h			7·07	0·5	6·86	0·2	7·43	0·3			7·62	0·4	6077·312	170 11
136	F w	2·97	1·8	3·03	0·6	2·95	0·2	3·09	0·4					5153·283	180 8
137	r u	1·05	1·1	0·95	0·7	1·31	0·3	1·09	0·8			1·16	0·5	3991·247	141 59
138	f b	8·51	0·9	8·86	0·4	9·68	0·2	8·57	0·3			8·78	0·3	6678·901	220 4
139	p r	9·05	1·6	8·76	0·9	8·98	0·2	8·84	1·2	8·49	0·4	8·14	0·4	5048·593	64 3
140	q u	9·18	1·1	9·19	0·7	8·77	0·3	9·11	0·4	8·86	0·5	8·93	0·5	3889·174	270 55
141	e m	9·65	2·1	9·90	1·8	0·11	0·2	9·93	1·0	0·01	0·8			5819·673	253 37
142	d h	9·50	0·5	9·62	0·5	9·88	0·2	9·57	0·2	9·47	0·4			6069·778	216 42
143	t u	1·96	1·2	1·77	3·4	1·61	0·6	1·43	1·8	1·47	2·6			601·802	102 9
144	m h	2·61	0·4	2·92	1·0	2·44	0·3	2·68	0·5	2·61	0·7			2602·743	298 19
145	z η	8·30	0·6	8·96	0·6	8·85	0·2	8·19	0·2	8·66	0·4			5138·674	247 41
146	æ u	3·01	1·3	2·98	0·6	2·76	0·2	3·26	0·8	2·96	0·4	3·17	0·4	4572·880	114 29
147	y ε	4·60	0·6	4·73	0·6	5·10	0·2	4·93	0·4			4·94	0·4	4504·567	284 35
148	ε a	8·31	1·0	8·00	0·5	8·49	0·2	8·56	0·6			7·85	0·4	6038·196	216 18
149	g h	4·66	2·2	4·50	1·6	4·08	0·5	4·44	0·9	4·46	1·0			814·486	232 20
150	E k	0·11	0·5	0·19	0·3	0·53	0·2	9·70	0·3			0·43	0·4	6020·581	183 19
151	F y	4·08	0·5	3·93	0·5	3·82	0·2	3·80	0·2			3·71	0·4	5914·559	217 11
152	f o	6·03	0·6	5·97	0·6	6·28	0·2	5·50	0·6	5·89	0·3			6796·100	68 32
153	p h	0·55	0·7	0·66	0·5	0·78	0·2	0·64	0·3			9·85	0·4	5910·554	269 51
154	q n	7·72	1·6	7·77	1·1	7·58	0·2	7·80	0·6	7·88	0·8			5517·438	53 28
155	e g	0·68	0·8	0·95	0·8	0·83	0·3	1·15	0·2	0·92	0·5			3560·883	48 5
156	d c	0·62	1·4	0·66	0·9	0·16	0·3	1·13	0·6	0·75	1·3			2910·695	338 25
157	m c	0·49	0·4	0·96	0·4	0·25	0·2	0·32	0·2	0·82	0·3			7050·745	262 27
158	z v	0·69	2·0	0·78	1·3	0·46	0·2	0·69	1·0	0·18	0·3	0·72	0·3	6640·513	106 1
159	æ v	0·98	1·7	0·82	0·8	0·56	0·3	0·51	0·9	0·43	0·6	0·71	0·6	3340·605	112 46
160	y u	3·90	0·4	4·16	0·4	4·29	0·2	3·81	0·3			4·10	0·3	6934·052	95 12
161	ε δ	2·47	2·1	2·07	1·2	1·90	0·4	2·32	0·2			2·55	0·8	5012·391	186 29
162	E g	1·31	0·5	1·49	0·5	1·34	0·2	1·06	0·2			1·65	0·4	5741·516	163 0
163	F u	9·40	0·6	9·52	0·1	9·55	0·2	9·54	0·4			9·54	0·4	6289·498	148 7

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TABLE VI.—*continued.*

Rotation No.	Stars.	Observed Distances.												Tabular Quantities.	
		Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.		Distance.	Position Angle.
		″	p′	″	p′	″	p′	″	p′	″	p′	″	p′	″	° ′
164	f k	0·27	3·2	0·42	1·8	0·32	0·3	0·32	1·4	0·21	1·2			3150·282	60 12
165	φ i	1·88	0·8	1·76	0·3	2·39	0·2	2·27	0·4			2·35	0·4	5001·880	250 13
166	e d	8·13	2·6	8·18	1·1	7·88	0·4	7·77	0·6	8·12	1·8			2018·018	189 31
167	θ α	4·47	1·6	4·40	1·4	4·62	0·2	4·60	0·8	4·00	0·7			6404·435	98 6
168	z y	0·62	1·4	0·78	1·2	0·28	0·4	0·76	0·3	0·17	0·9			1890·485	162 42
169	y η	0·09	1·1	0·24	0·6	9·77	0·2	0·59	0·7			0·10	0·4	5319·931	88 26
170	E f	2·21	1·2	2·41	1·5	2·42	0·2	2·39	1·2			2·51	0·4	5042·837	151 49
171	f h	9·88	0·5	9·74	1·6	9·76	0·4	9·76	0·6	9·59	0·9			2049·813	41 9
172	f d	9·53	2·1	9·69	1·4	9·01	0·3	9·65	0·6	9·55	0·5	9·17	0·5	4029·423	214 26
173	p m	7·96	3·7	7·90	1·7	8·19	0·3	7·73	0·8	8·16	0·6	8·39	0·6	3827·888	70 $\overline{56}$
174	p n	6·13	3·2	6·09	1·7			5·93	1·2					4365·939	17 45
175	d g	0·40	0·6	9·88	0·6	1·18	0·2			0·15	0·4			5290·098	34 19
176	f g	0·47	2·7	0·29	1·4	0·73	0·5	0·43	0·4			0·39	1·1	1260·703	33 58
177	p g	4·46	0·4	4·98	0·4	4·39	0·2	5·45	0·2			5·81	0·3	6574·657	265 31

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CHAPTER VI.

Determination of the Definitive Systematic Corrections.

The distances measured by the various observers having been already reduced to the same system of scale-value by corrections derived from the measures of the Standard Stars, it may, at first sight, seem unnecessary to seek for further systematic errors, but the following possible sources of error remain to be considered :—

1. Each observer may have a personal peculiarity in the way in which he causes star-discs to pass through each other, which habit would produce a small constant difference in his observations of all distances greater or less than the standard distance.

2. There may be in the Standard Stars themselves some peculiarity (of colour, for example) which may produce a systematic difference in the method of their bisection from the average of other stars, and which would give a different scale-value for them and for other stars.

3. There may be minute changes of scale-value for different distances produced by optical causes, such as a change in the form of the optical discs in consequence of the inclination of the axes of the segments with respect to the axis of the eye-piece, especially in the measurement of large angles, or for other reasons, such as a difference between the radius of curvature of the slides and the focal length of the object glass, &c.

The sum of these errors is very small, and it will be assumed that for each observer the systematic correction may be represented by the expression

$$x + sy + s^2z$$

as, in this way, a sufficiently approximate curve (known previously to be nearly a straight line) can be more accurately computed, having regard to the weights, than by a graphical process.

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Comparison of Gill and Finlay.

For this comparison the following weights, corresponding to the actual mean errors for each observer, each distance, and each class of magnitude, were employed, viz. :—

Distance in terms of the Standard Distance*.	Gill.			Finlay.
	Fainter† Component. Mag. 6·6–7·9.	Fainter† Component. Mag. 8·0–8·2.	Fainter† Component. Mag. 8·2–8·5.	All magnitudes.
	p	p	p	p
0·1	5·71	3·63	5·00	2·86
0·2	4·00	2·67	3·63	2·10
0·3	3·07	2·00	2·86	1·74
0·4	2·23	1·60	2·10	1·43
0·5	1·82	1·33	1·67	1·18
0·6	1·54	1·08	1·25	1·02
0·7	1·29	0·91	1·05	0·89
0·8	1·14	0·78	0·89	0·77
0·9	1·05	0·69	0·77	0·66
1·0	0·98	0·61	0·68	0·56
1·1	0·91	0·54	0·60	0·49
1·2	0·87	0·49	0·54	0·44

* The distance of the Standard stars is 6456″·6 : weight = 1 corresponds with a mean error of ± 0″·20 for the single observation.

If w is the weight of the observation dependent on the number of observations and the quality of the definition as given in the details of the original observations (Table III.), then the combining weight is

$$pw,$$

where p is taken from the above Table with the arguments "magnitude of the fainter component of the pair," and "distance."

The equations have then the form

$$x + \frac{s - 4000}{1000} y + \left(\frac{s - 4000}{1000}\right)^2 z = \text{G—F with the weight } \frac{p_g \times p_f}{p_g + p_f}$$

† In all the discussions of error depending on magnitude, and in the sub-division of the pairs into various classes depending on magnitude, Schönfeld's magnitudes, as printed in Table III., were employed—because Auwers' discussion of the magnitudes was not then available ; but in the Equations to determine the error depending on magnitude in the Right Ascensions (contained in this chapter), and in all subsequent parts of the work, Auwers' magnitudes, as given in Table V., are used.

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Where s is the distance, expressed in seconds of arc.

G " " " " as observed by Gill.

F " " " " " " Finlay.

p_g and p_f the combining weights for Gill and Finlay respectively, computed as above described.

Having regard to these weights, the following normal equations were obtained by the method of least squares :—

$$\begin{aligned} 133{\cdot}28\,x - 14{\cdot}57\,y + 391{\cdot}63\,z &= -4{\cdot}76'' \\ -14{\cdot}57 \quad +392{\cdot}56 \quad -125{\cdot}23 &= -7{\cdot}42 \\ 391{\cdot}63 \quad -125{\cdot}23 \quad +2524{\cdot}78 &= -9{\cdot}16 \end{aligned}$$

whence

$x = -{\cdot}045''$	weight	72·5	mean error	$\pm 0{\cdot}025''$
$y = -{\cdot}020$	"	386·0	"	$\pm\ {\cdot}011$
$z = +{\cdot}002$	"	1356·6	"	$\pm\ {\cdot}006$

After substitution of these values in the original equations we obtain in the usual way

$$\frac{[pvv]}{n-m} = \epsilon^2 = 0''{\cdot}0446$$

and thence the mean errors of x, y, and z, as given above.

The resulting *mean error* of an observation whose weight is unity is thus $\pm 0''{\cdot}211$ and the *mean error* assumed " " " was $\pm 0''{\cdot}200$ which is probably as exact an agreement as the uncertainties of the discussion of the weights would permit.

If we neglect the term z, whose *mean error* is three times its amount, we obtain

$x = -0{\cdot}038''$	weight	132·7	mean error*	$\pm 0{\cdot}018''$
$y = -\ {\cdot}020$	"	391·0	"	$\pm\ {\cdot}011$

* In computing the values of the mean errors of x, y, and z, for Class I. and Class II., as well as those of x and y in the general solution, neglecting z, the same value of ϵ^2 has been adopted as that derived in the first general solution, as this plan is sufficiently approximate for our present purposes.

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The observations were further compared in two classes, viz., pairs in which the difference of brightness was rather less than one magnitude, and pairs in which there was a greater difference—or more strictly, pairs in which no wire gauze screen was employed to equalize the brightness of the components, and pairs in which such a screen was employed.

From Class I. (no screen) the normal equations are

$$\begin{aligned} 79{\cdot}81x - 3{\cdot}88y + 217{\cdot}74z &= -2{\cdot}88'' \\ -3{\cdot}88 + 217{\cdot}74 - 59{\cdot}98 &= -3{\cdot}11 \\ 217{\cdot}74 - 59{\cdot}98 + 1383{\cdot}95 &= -3{\cdot}38 \end{aligned}$$

whence

$x = -0{\cdot}050''$	weight 45·4	mean error*	$\pm 0{\cdot}031''$
$y = -\ {\cdot}014$	„ 214·5	„	$\pm\ {\cdot}014$
$z = +\ {\cdot}005$	„ 778·7	„	$\pm\ {\cdot}008$

From Class II. (with screen) the normal equations are

$$\begin{aligned} 53{\cdot}47x - 10{\cdot}69y + 174{\cdot}75z &= -1{\cdot}88'' \\ -10{\cdot}69 + 174{\cdot}75 - 65{\cdot}25 &= -4{\cdot}31 \\ 174{\cdot}75 - 65{\cdot}25 + 1140{\cdot}83 &= -5{\cdot}78 \end{aligned}$$

whence

$x = -0{\cdot}038''$	weight 26·7	mean error*	$\pm 0{\cdot}041'$
$y = -\ {\cdot}027$	„ 171·0	„	$\pm\ {\cdot}016$
$z = -\ {\cdot}001$	„ 564·4	„	$\pm\ {\cdot}009$

The two classes may thus be accepted as in perfect agreement very far within the limits of their probable error, and consequently the use of the screen produces no sensible difference between Gill and Finlay's method of observing which can be detected from the observations. Finally, in order to examine the actual facts without reference

* In computing the values of the mean errors of x, y, and z, for Class I. and Class II., as well as those of x and y in the general solution, neglecting z, the same value of ϵ^2 has been adopted as that derived in the first general solution, as this plan is sufficiently approximate for our present purposes.

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to any assumed law of systematic difference, the observations of Gill and Finlay are compared directly in the following table. The weights have been computed on the assumption that the single observation of each observer has a weight of unity.

Limits of distance.	No. of Pairs.	Mean Distance.	Mean Observed Values of Gill—Finlay.		Weight.	Corresponding Computed Values.	O—C.
			I.	II.			
″ ″		″	″	″		″	″
0 to 1200	3	860	+0·15	+0·14	1·7	+0·04	+0·10
1200 to 1800	9	1470	— ·02	— ·03	5·5	+ ·02	— ·05
1800 to 2400	11	2090	·00	— ·02	7·5	·00	— ·01
2400 to 3000	9	2670	+ ·08	+ ·05	5·9	— ·01	+ ·07
3000 to 3600	23	3330	— ·14	— ·14	18·5	— ·03	— ·11
3600 to 4200	16	3810	+ ·04	·00	16·5	— ·04	+ ·08
4200 to 4800	22	4460	·00	+ ·01	20·4	— ·05	+ ·05
4800 to 5400	20	5110	— ·01	— ·03	17·2	— ·06	+ ·04
5400 to 6000	18	5710	— ·14	— ·12	17·2	— ·07	— ·06
6000 to 6600	16	6350	— ·08	— ·07	12·7	— ·08	·00
6600 to 7200	22	6860	— ·12	— ·12	22·4	— ·08	— ·04

The columns marked I. and II. under the heading Gill *minus* Finlay represent the results according to the two methods of reduction already described. The computed values represent the results of the first solution (including z). The comparison of the observed and computed values, in the column marked O—C, shews only one instance (viz., for the distances 3,000″ to 3,600″) where the discordance amounts to as much as twice its *mean error*.

Comparison, Gill and Jacoby.

In comparing Mr. Jacoby's observations it was impossible to start with weights determined from the agreement of his own observations *inter se*, for, as already explained, Jacoby, as a rule, observed each pair of stars only once. It is evident, however, from inspection of the agreement of his observations with the general means, that his mean error of observation exceeds that of any of the other observers; therefore in forming the equations Gill—Jacoby the observations of the latter observer received only half weight, or rather the former observer's weight was doubled, the weights of the equations having been computed by the formula

$$p = \frac{2\,n_g \times n_j}{2\,n_g + n_j}$$

where n_g and n_j represent the number of observations by Gill and Jacoby respectively.

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The resulting normals are

$$\begin{aligned} 91{\cdot}21\,x + 36{\cdot}79\,y + 263{\cdot}21\,z &= -\ 6{\cdot}38'' \\ 36{\cdot}79 + 263{\cdot}42 + 228{\cdot}95 &= -20{\cdot}96 \\ 263{\cdot}21 + 228{\cdot}95 + 1612{\cdot}85 &= -22{\cdot}47 \end{aligned}$$

whence

$x = -0{\cdot}057''$	weight 48·25	mean error	$\pm 0{\cdot}052''$
$y = -\ {\cdot}077$	„ 230·9	„	$\pm\ {\cdot}023$
$z = +\ {\cdot}006$	„ 792·6	„	$\pm\ {\cdot}013$

$$\frac{[pvv]}{n-m} = \epsilon^2 = 0''{\cdot}1265$$

$$\epsilon = \pm 0''{\cdot}366$$

The reality of the term z is very doubtful, since its *mean error* is more than double its amount. If we omit z we obtain

$x = -0{\cdot}040''$	weight 86·1
$y = -\ {\cdot}074$	„ 248·6

Comparison of Gill and Chase.

For the Yale observations by Mr. Chase the comparison with Dr. Gill's observations has been made by giving weights in proportion to the number of observations by each observer, and computing the weights of the equations in the manner already described.

The resulting normals are

$$\begin{aligned} 157{\cdot}88\,x + 88{\cdot}22\,y + 459{\cdot}04\,z &= -\ 6{\cdot}45'' \\ 88{\cdot}22 + 459{\cdot}04 + 555{\cdot}28 &= -19{\cdot}78 \\ 459{\cdot}04 + 555{\cdot}28 + 2885{\cdot}74 &= -25{\cdot}22 \end{aligned}$$

whence

$x = -0{\cdot}029''$	weight 84·9	mean error	$\pm 0{\cdot}030''$
$y = -\ {\cdot}042$	„ 352·2	„	$\pm\ {\cdot}015$
$z = +\ {\cdot}004$	„ 1333·2	„	$\pm\ {\cdot}008$

$$\frac{[pvv]}{n-m} = \epsilon^2 = 0''{\cdot}0782$$

$$\epsilon = \pm 0''{\cdot}280$$

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Here, again, the term z comes out with a *mean error* twice as great as its amount. If we omit this term we find

$x = -0''\cdot051$	weight	140·9	mean error	$\pm 0''\cdot024$
$y = -\ \cdot033$	,,	409·7	,,	$\pm\ \cdot014$

If we divide the Yale observations into two classes, as in the Cape observations, we find

Class I. (no screen)

$x = -0''\cdot037$	weight	86·3	mean error	$\pm 0''\cdot030$
$y = -\ \cdot027$	,,	211·6	,,	$\pm\ \cdot019$

Class II. (with screen)

$x = +0''\cdot010$	weight	54·6	mean error	$\pm 0''\cdot038$
$y = -\ \cdot054$	,,	196·7	,,	$\pm\ \cdot020$

The direct comparison Gill—Chase without any assumed law gives the following results—

Limits of Group.	No. of Pairs.	Mean Distance.	Gill—Chase.		Weight.	Corresponding Computed Values.	O—C.
			I.	II.			
′ ″		″	″	″		″	″
0 to 1200	3	830	+0·48	+0·48	1·7	+ ·15	+ ·33
1200 to 1800	9	1470	+ ·04	+ ·03	6·5	+ ·11	— ·07
1800 to 2400	11	2080	+ ·07	+ ·06	9·1	+ ·07	·00
2400 to 3000	9	2690	+ ·05	+ ·03	6·6	+ ·04	·00
3000 to 3600	23	3320	— ·05	— ·10	21·8	·00	— ·08
3600 to 4200	16	3880	+ ·05	— ·03	16·0	— ·02	+ ·03
4200 to 4800	22	4430	+ ·05	+ ·05	20·6	— ·05	+ ·10
4800 to 5400	19	5110	— ·03	— ·07	20·2	— ·07	+ ·02
5400 to 5700	18	5700	— ·14	— ·13	17·8	— ·10	— ·04
6000 to 6600	16	6340	— ·04	— ·10	13·7	— ·11	+ ·04
6600 to 7200	21	6780	— ·10	— ·07	20·1	— ·12	+ ·03

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GÖTTINGEN OBSERVATIONS. DR. SCHUR.

The comparison with Gill has been made precisely in the same manner as in the case of the Yale observations. The resulting normals are

$$65{\cdot}76x + 27{\cdot}74y + 194{\cdot}12z = +0''{\cdot}13$$
$$27{\cdot}74 + 193{\cdot}87 + 216{\cdot}98 = -7{\cdot}55$$
$$194{\cdot}12 + 216{\cdot}98 + 1296{\cdot}06 = +0{\cdot}69$$

whence

$x = -0''{\cdot}006$	weight	36·5	mean error	$\pm 0''{\cdot}046$
$y = -\ {\cdot}049$	,,	156·9	,,	$\pm\ {\cdot}022$
$z = +\ {\cdot}0095$	,,	622·9	,,	$\pm\ {\cdot}011$

$$\frac{[pvv]}{n-m} = \epsilon^2 = 0''{\cdot}0782$$
$$\epsilon = \pm 0''{\cdot}279$$

Here also the *mean error* of z is greater than its amount.

If z is omitted we get

$x = +0''{\cdot}020$	weight	61·8	mean error	$\pm 0''{\cdot}036$
$y = -\ {\cdot}042$	,,	182·2	,,	$\pm\ {\cdot}021$

If the observations are divided into two classes as before we have

From Class I. (no screen)

$x = +0''{\cdot}046$	weight	37·9	mean error	$\pm 0''{\cdot}045$
$y = -\ {\cdot}028$	,,	87·1	,,	$\pm\ {\cdot}030$

From Class II. (with screen)

$x = -0''{\cdot}018$	weight	23·5	mean error	$\pm 0''{\cdot}058$
$y = -\ {\cdot}049$	,,	91·4	,,	$\pm\ {\cdot}029$

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GÖTTINGEN OBSERVATIONS. DR. AMBRONN.

From a similar comparison with Gill the resulting normals are

$$\begin{aligned} 62{\cdot}91x + 34{\cdot}58y + 198{\cdot}04z &= -\ 6{\cdot}15'' \\ 34{\cdot}58 + 197{\cdot}04 + 193{\cdot}98 &= -\ 8{\cdot}73 \\ 198{\cdot}04 + 193{\cdot}98 + 1209{\cdot}29 &= -18{\cdot}40 \end{aligned}$$

whence

$x = -0{\cdot}100''$	weight 30·43	mean error $\pm 0{\cdot}051''$
$y = -\ {\cdot}033$	„ 165·66	„ $\pm\ {\cdot}022$
$z = +\ {\cdot}006$	„ 545·17	„ $\pm\ {\cdot}012$

$$\frac{[pvv]}{n-m} = \epsilon^2 = 0''{\cdot}0791$$

$$\epsilon = \pm 0''{\cdot}281$$

If z is omitted, as probably unreal, we get

$x = -0{\cdot}081''$	weight 56·8	mean error $\pm 0{\cdot}038''$
$y = -\ {\cdot}030$	„ 178·0	„ $\pm\ {\cdot}021$

If the observations are divided into two classes we have

From Class I. (no screen)

$x = -0{\cdot}095''$	weight 37·7	mean error $\pm 0{\cdot}046''$
$y = -\ {\cdot}034$	„ 121·9	„ $\pm\ {\cdot}025$

From Class II. (with screen)

$x = -0{\cdot}051''$	weight 19·0	mean error $\pm 0{\cdot}065''$
$y = -\ {\cdot}018$	„ 55·6	„ $\pm\ {\cdot}038$

Throughout the whole of this discussion there is no single series of comparisons which can be held to give valid evidence of the existence of a term depending upon the square of the distance, as the term z, in every case, comes out small, and with a *mean error* greater than, and generally double, its amount. But it is remarkable that in every case the value of z is positive, which evidence collectively may have some value, although the individual values have no proved reality. The only course which offers

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a possible solution of this question seems to be to compare the Heliometer measures collectively with the meridian observations, the former being first reduced to a common system with corrections depending on x, y, and z, and secondly with corrections depending on x and y only.

The collective terms x and y seem to be real, as they come out generally with mean errors sensibly less than their respective values. It is remarkable that, for each observer compared with Gill, the term y is negative.

The following are the corresponding corrections (computed I., with z, and II., excluding z) applicable to the results of the different observers :—

SYSTEMATIC CORRECTIONS TO REDUCE OTHER OBSERVERS TO GILL.

Distance.	Finlay.		Jacoby.		Chase.		Schur.		Ambronn.	
	I.	II.	I.	II.	I.	II.	I.	II.	I.	II.
″	″	″	″	″	″	″	″	″	″	″
600	+·05	+·03	+·27	+·21	+·16	+·06	+·26	+·16	+·10	+·02
1000	+·035	+·02	+·23	+·18	+·13	+·05	+·22	+·15	+·06	+·01
2000	·00	·00	+·12	+·11	+·07	+·02	+·13	+·10	—·01	—·03
3000	—·02	—·02	+·03	+·03	+·02	—·02	+·05	+·06	—·05	—·05
4000	—·045	—·04	—·06	—·04	—·03	—·05	—·011	+·02	—·10	—·08
5000	—·06	—·06	—·13	—·11	—·07	—·08	—·045	—·02	—·125	—·11
6000	—·075	—·08	—·18	—·19	—·105	—·12	—·065	—·06	—·14	—·14
7000	—·08	—·10	—·23	—·26	—·12	—·15	—·065	—·11	—·14	—·17

It appears from these corrections that all the observers have measured the short distances shorter than Gill, and the long distances longer than Gill. The most unexpected result is that the various observers do not agree more exactly in the measurement of distances nearly the same as the Standard distance. All the observations were reduced to the scale-value derived from measures of the Standard stars, and therefore the measures of distances of about 6000″ or 7000″ should be nearly free from errors depending upon x, y, and z. The only possible explanations of this difference, apart from accidental errors, seem to be :—

1. There may be a constant difference in the method employed for pointing on the scale-divisions by the observer of the Standard stars and the observer by whom the division-errors were determined.

2. There may be some peculiarity of colour or other circumstance in the Standard stars (one *is* sensibly of different colour from the other) which may lead to a small peculiarity in *pointing* (*i.e.*, in the way in which the discs are made to pass through each other).

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3. There may be some error depending on the inclination of the direction of measurement to the vertical. This error, if it exists, will be to some extent independent of the parallactic angle, because, from the arrangement of the observations, the parallactic angle will be the same, in the mean, for the Standard stars, as for all other pairs. If, therefore, the *scale-value* is influenced by the direction of measurement to the vertical, the effect of this influence upon any other pair of stars will be a function of the *difference* only of the position-angle of the pair in question from the position-angle of the Standard stars. On the other hand if it is not the *scale-value* but the *absolute distance* of every pair that is affected by the inclination of the direction of measurement, then an error will be introduced depending both on the relative distance as well as on the relative position-angle of the pair in question to the distance and position-angle of the Standard stars. It is probable, *a priori*, that this error is eliminated by use of the reversing prism.

4. It is possible to suppose that a small error may arise in the measurement of large distances on account of the opposite unsymmetrical incidence of the rays from the two segments with respect to the optical axis of the eye-piece. This dissymmetry would probably produce effects on the pointing varying with the observer's habit of focussing, or rather with the manner in which the fixed focal point which he habitually uses has been adjusted, and this alone might account for apparent variation of the scale-value for different observers with the same instrument. It is also possible that the same cause may produce similar errors, but varying in amount, for all observers, but it can in no way account for the difference in measuring distances nearly the same as that of the Standard stars. It is probable, however, in the case of a coloured star that the dissymmetry would be greater than for stars of normal tint, because the focus must vary slightly for stars of different colour.

With regard to the first of these hypotheses, in the case of Gill and Finlay, the results of the investigation of the same division-errors by the same observers agree far within the limits necessary to explain the above discordance. But from the fact that the division-errors are determined with a different microscope from that employed in observation (Monthly Notices, vol. XLIX., pp. 105–115), it is just possible that some small part of the discordance may be due to this cause, notwithstanding the care taken by Messrs. Repsold to make the illumination, the magnifying power, and the proportion of the thickness of the webs to that of the divisions as nearly identical as possible in both microscopes.

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The whole of these systematic discrepancies, however, so little exceed the probable errors of their determination as to preclude the possibility of their complete separation by the introduction of a large number of hypothetical constants with corresponding factors in the form of equations of condition. For the present, therefore, we shall accept the systematic corrections, *first*, as having a real existence of unexplained origin, and *secondly* as purely accidental errors.

The *first* step is therefore to reduce the whole of the observations of Table VI. to a common system by aid of the Table of "Systematic Corrections to reduce other Observers to Gill" given in the present chapter. To make the discussion complete, the latter operation must be performed according both to columns I. and II. of the Table of systematic corrections, the first taking the terms depending on the square of the distance as real, the second rejecting these terms because they are in each case determined with mean errors smaller than their amount. The results thus obtained for each pair of stars are then combined, having regard to the corresponding weights (taken from the preliminary system of weights given at the conclusion of the preceding chapter) and to the number of observations made by each observer.

Secondly, the observations of each pair are reduced and combined in the same way, excepting that no systematic corrections are applied.

In this way we obtain three different values of the observed distance, viz. :—

O_1 with systematic corrections including z.

O_2 „ „ „ excluding z.

O_3 without any systematic corrections.

Each of the observed distances so deduced is affected systematically by such erroneous scale-value as may be due to error in the adopted distances of the Standard stars, and also, in the cases of O_1 and O_2, by any systematic errors which may exist in Gill's Heliometer observations. The true measured values must be put, as before,

$$= O + x + \frac{s - 4000}{1000} y + \left(\frac{s - 4000}{1000}\right)^2 z \quad - \quad - \quad (1)$$

The distances computed from the meridian observations will be affected by errors that may exist in the Right Ascensions on account of personality of the observers depending on magnitude. Dr. Auwers has already discussed the meridian observations and reduced each series to the same system in regard to personal equation depending

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on magnitude. But the data at his disposal for determining the absolute relative corrections on account of magnitude are by no means so powerful as those afforded by the Heliometric triangulation. Hence it is desirable to include in the general discussion terms depending on the magnitude of the stars.

Let $*_1$ and $*_2$ denote two stars of different magnitude, of which $*_1$ is the brighter.

Let s and p denote the distance and position-angle respectively, p being reckoned in the usual way from north through east, the brighter star being taken for origin.

Let m_1 and m_2 denote their magnitudes (of which m_1 belongs to the brighter star), or rather the difference of their magnitudes from 8·0 (according to this, for a 6th magnitude star, m is = − 2·0).

If the systematic error of R.A. depending upon magnitude could be supposed to vary directly as the magnitude, then the true Right Ascensions of the stars $*_1$ and $*_2$, apart from accidental errors, would be

$$\alpha_1 + m_1 u \text{ and } \alpha_2 + m_2 u$$

respectively, where u is a factor to be determined.

But it cannot be assumed without trial that the personal equation in R.A. varies directly with the magnitude—it is therefore probably desirable to take also into account a term depending upon the square of the magnitude. Hence the corrections for magnitude will become

$$m_1 u + m_1^2 w \text{ and } m_2 u + m_2^2 w$$

and the true difference of R.A. between the stars will be

$$\alpha_2 - \alpha_1 + (m_2 - m_1) u + (m_2^2 - m_1^2) w$$

If the tabular distance (C) has been computed from values of α_1 and α_2 to which corrections for magnitude have not been applied, then the true tabular distance will be

$$C + \sin p \cos \delta_0 (m_2 - m_1) u + \sin p \cos \delta_0 (m_2^2 - m_1^2) w \quad . \quad . \quad (2)$$

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Deducing the equivalents of u and w on the great circle (that is, writing $\sin p$ for $\sin p \cos \delta_0$), and equating the expressions (1) and (2) we have

$$\sin p\,(m_2 - m_1)\,u + \sin p\,(m_2^2 - m_1^2)\,w - x - \left(\frac{s-4000}{1000}\right) y - \left(\frac{s-4000}{1000}\right)^2 z = O - C \quad \cdot (3)$$

If p_o is the weight of the observed distance and p_c is the weight of the distance computed from the meridian observations, then the weight of each equation of type (3) is

$$p = \frac{p_o \times p_c}{p_o + p_c}$$

Forming equations from all the observed distances on this type we may present them in the following tabular form :—

The first *column* gives the adopted rotation number corresponding to that in the table of computed distances. Table VI.*

The next five *columns* give the coefficients of u, w, x, y and z.

The *columns* marked n_1, n_2, n_3 give the values of $O - C$ when the observed distances are computed according to O_1, O_2 and O_3 respectively, as already defined.

The next three *columns* give the weights of the observed distances,† of the tabular distance, and of $O - C$ respectively.

The last two *columns* give the residuals after substitution of the unknown quantities according to two of the solutions, as afterwards explained.

---

* The omissions in the successive numbering of the equations result chiefly from pairs which involve the auxiliary stars E and F. These stars were selected to strengthen the triangulation after the list for meridian observations was circulated, and hence no equations result from them in the present stage of the discussion.

† It should be here mentioned that in the computation of the weights of the observed distances no account has been taken of the error in the determination of the proper motions employed to reduce the Heliometer observations from about 1890·5 to 1889·53 ; because, at the time when the equations were formed, I had not the information afterwards supplied by Dr. Auwers, which permitted an estimation of that error to be made. The changes in the weights produced by rigorous computation are at this stage of the discussion quite insignificant compared with the uncertainties of the weights themselves.

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EQUATIONS TO DETERMINE THE DEFINITIVE CORRECTIONS FOR SCALE-VALUE OF THE HELIOMETER OBSERVATIONS IN THE TRIANGULATION OF THE VICTORIA COMPARISON STARS, AND THE RESIDUAL ERRORS DUE TO MAGNITUDE IN AUWERS' DISCUSSION OF THE MERIDIAN OBSERVATIONS OF THESE STARS.

Rotation No.	Coefficients of					O — C.			Weights.			Residuals.	
	u	w	x	y	z	n_1	n_2	n_3	p_o	p_c	p	r_1	r_2
						″	″	″				″	″
1	—0·83	+1·57	—1·00	—2·47	— 6·10	—0·24	—0·24	—0·16	3·8	3·1	1·71	—0·23	—0·20
2	— ·98	·00	—1·00	+ ·59	— ·35	— ·18	— ·18	— ·17	2·8	2·8	1·40	— ·15	— ·10
3	+ ·25	— ·13	—1·00	—2·36	— 5·57	— ·07	— ·08	— ·01	3·8	3·6	1·85	— ·10	— ·08
4	— ·32	+ ·13	—1·00	—1·06	— 1·12	+ ·14	+ ·14	+ ·20	2·0	3·3	1·24	+ ·14	+ ·20
5	+ ·73	·00	—1·00	— ·42	— ·18	— ·15	— ·15	— ·12	2·8	3·1	1·47	— ·17	— ·12
6	— ·50	— ·15	—1·00	+ ·70	— ·49	— ·07	— ·06	— ·06	6·1	4·4	2·56	— ·05	·00
7	— ·18	— ·14	—1·00	+2·42	— 5·86	+ ·11	+ ·08	+ ·05	7·6	2·9	2·10	+ ·13	+ ·14
9	+ ·60	+ ·12	—1·00	+ ·52	— ·27	+ ·05	+ ·06	+ ·07	5·3	3·3	2·03	+ ·04	+ ·10
11	·00	·00	—1·00	+ ·45	— ·20	— ·12	— ·12	— ·11	6·8	4·3	2·63	— ·12	— ·07
13	+ ·08	+ ·04	—1·00	—3·28	—10·76	— ·17	— ·19	— ·12	2·0	3·6	1·29	— ·20	— ·23
14	— ·13	— ·04	—1·00	—1·95	— 3·80	+ ·40	+ ·40	+ ·44	2·6	3·3	1·45	+ ·38	+ ·40
15	— ·26	— ·13	—1·00	+ ·60	— ·36	+ ·22	+ ·23	+ ·22	3·9	2·6	1·56	+ ·23	+ ·27
16	+ ·07	·00	—1·00	— ·43	— ·18	+ ·17	+ ·17	+ ·20	5·8	2·6	1·80	+ ·17	+ ·21
17	—1·29	+3·10	—1·00	+2·45	— 6·00	+ ·05	+ ·03	·00	10·8	3·8	2·81	+ ·13	+ ·14
18	+ ·56	—2·06	—1·00	+ ·30	— ·09	— ·18	— ·17	— ·16	5·8	3·6	2·22	— ·12	— ·16
19	+ ·40	+ ·24	—1·00	+ ·65	— ·42	— ·06	— ·05	— ·05	4·6	3·5	1·99	— ·06	— ·01
20	—1·87	+1·68	—1·00	+ ·15	— ·02	— ·04	— ·03	— ·02	4·0	3·0	1·71	+ ·02	+ ·07
21	+ ·20	·00	—1·00	—1·84	— 3·39	+ ·20	+ ·21	+ ·27	2·7	3·1	1·44	+ ·18	+ ·22
22	—1·50	+1·95	—1·00	—3·10	— 9·61	+ ·02	+ ·01	+ ·08	2·7	3·2	1·46	+ ·04	+ ·03
23	+ ·01	·00	—1·00	+1·00	— 1·00	+ ·07	+ ·07	+ ·09	3·2	3·5	1·67	+ ·08	+ ·15
24	+ ·02	— ·01	—1·00	+2·29	— 5·24	+ ·03	+ ·01	·00	5·7	3·9	2·31	+ ·05	+ ·08
25	·00	·00	—1·00	+ ·98	— ·96	— ·05	— ·05	— ·04	3·2	3·8	1·74	— ·04	+ ·02
26	— ·64	+ ·32	—1·00	+ ·57	— ·32	+ ·28	+ ·28	+ ·31	3·0	3·4	1·59	+ ·30	+ ·37
28	— ·08	·02	—1·00	— ·93	— ·86	+ ·21	+ ·21	+ ·24	1·9	3·6	1·24	+ ·20	+ ·24
29	— ·35	+ ·70	—1·00	+1·27	— 1·61	— ·15	— ·15	— ·14	2·5	3·6	1·48	— ·12	— ·06
30	+ ·78	— ·78	—1·00	—2·40	— 5·76	— ·03	— ·04	+ ·03	2·9	3·5	1·59	— ·08	— ·06
31	·00	·00	—1·00	—2·48	— 6·15	+ ·05	+ ·04	+ ·09	3·9	2·8	1·63	+ ·03	+ ·02
32	— ·09	+ ·01	—1·00	+ ·03	·00	+ ·01	+ ·01	+ ·03	7·1	2·5	1·85	+ ·01	+ ·06
33	·00	·00	—1·00	— ·38	— ·14	— ·01	— ·02	+ ·02	1·6	2·7	1·00	— ·01	+ ·03
34	— ·58	— ·23	—1·00	+1·90	— 3·61	+ ·01	·00	·00	4·0	2·9	1·68	+ ·04	+ ·09

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EQUATIONS TO DETERMINE THE DEFINITIVE CORRECTIONS—*continued.*

Rotation No.	Coefficients of					O—C.			Weights.			Residuals.	
	u	w	x	y	z	n_1	n_2	n_3	p_o	p_c	p	r_1	r_3
						″	″	″				″	″
39	+1·29	−1·93	−1·00	−2·70	− 7·29	+0·23	+0·32	+0·26	4·2	2·7	1·64	+0·16	+0·13
40	+ ·27	+ ·03	−1·00	−1·51	− 2·28	+ ·35	+ ·35	+ ·41	2·6	3·3	1·45	+ ·33	+ ·37
41	+ ·29	− ·15	−1·00	−1·62	− 2·62	+ ·33	+ ·33	+ ·38	2·9	2·5	1·34	+ ·31	+ ·34
42	+ ·26	+ ·03	−1·00	−2·69	− 7·24	+ ·03	+ ·02	+ ·11	2·4	3·5	1·42	·00	+ ·02
43	− ·60	+ ·36	−1·00	+1·91	− 3·65	+ ·12	+ ·11	+ ·10	4·3	2·6	1·62	+ ·15	+ ·19
44	+ ·62	− ·31	−1·00	+1·54	− 2·37	− ·25	− ·26	+ ·25	3·9	3·0	1·70	− ·25	− ·20
45	− ·20	− ·04	−1·00	− ·70	− ·49	+ ·04	+ ·04	+ ·09	2·6	3·0	1·39	+ ·04	+ ·10
46	+1·48	−1·63	−1·00	+1·71	− 2·92	+ ·10	+ ·09	+ ·09	4·8	3·5	2·02	+ ·07	+ ·11
47	− ·89	+1·51	−1·00	− ·18	− ·03	− ·10	− ·10	− ·07	3·3	3·0	1·57	− ·07	− ·02
48	+ ·08	− ·14	−1·00	−1·10	− 1·21	− ·22	− ·22	− ·17	3·1	3·6	1·67	− ·23	− ·19
49	− ·06	+ ·03	−1·00	+1·94	− 3·76	− ·02	− ·03	− ·03	7·0	3·0	2·10	·00	+ ·05
50	+ ·06	+ ·04	−1·00	− ·59	− ·35	+ ·09	+ ·09	+ ·13	3·4	3·8	1·79	+ ·08	+ ·14
51	+ ·27	·00	−1·00	+1·84	− 3·39	− ·28	− ·29	− ·29	6·8	3·3	2·22	− ·27	− ·22
52	+ ·20	− ·16	−1·00	+1·45	− 2·10	− ·13	− ·13	− ·15	4·2	3·0	1·75	− ·12	− ·09
53	− ·26	+ ·18	−1·00	−2·74	− 7·51	+ ·03	+ ·02	+ ·08	3·2	3·6	1·69	+ ·01	·00
54	+ ·77	·00	−1·00	+ ·78	− ·61	+ ·06	+ ·05	+ ·07	6·5	4·6	2·69	+ ·05	+ ·10
55	− ·30	+ ·15	−1·00	− ·53	− ·28	− ·13	− ·12	− ·08	3·8	3·6	1·85	− ·13	− ·06
56	− ·33	− ·10	−1·00	+ ·59	− ·35	+ ·03	+ ·03	+ ·04	5·8	3·7	2·26	+ ·04	+ ·09
57	− ·21	− ·06	−1·00	+ ·60	− ·36	− ·05	− ·05	− ·05	6·5	4·3	2·59	− ·04	·00
58	− ·58	·00	−1·00	− ·65	− ·42	− ·07	− ·07	− ·04	2·4	3·0	1·33	− ·06	− ·02
59	+ ·43	+ ·04	−1·00	− ·39	− ·15	+ ·03	+ ·04	+ ·07	2·3	3·5	1·39	+ ·02	+ ·07
60	−2·30	+4·36	−1·00	−2·94	− 8·64	− ·13	− ·15	− ·07	3·0	3·6	1·64	− ·07	− ·08
61	+ ·15	+ ·09	−1·00	+1·30	− 1·69	+ ·04	+ ·02	+ ·01	4·1	3·2	1·80	+ ·05	+ ·07
62	−1·10	−1·54	−1·00	+2·18	− 4·75	− ·06	− ·08	− ·12	8·0	3·9	2·62	·00	·00
63	·00	·00	−1·00	+1·15	− 1·32	− ·07	− ·07	− ·07	7·6	4·3	2·75	− ·06	− ·01
64	+ ·10	+ ·07	−1·00	+ ·57	− ·32	− ·04	− ·04	− ·04	4·3	3·0	1·77	− ·04	·00
65	+ ·18	+ ·07	−1·00	− ·48	− ·23	+ ·22	+ ·22	+ ·24	2·9	3·3	1·54	+ ·21	+ ·25
66	− ·49	+ ·69	−1·00	−2·91	− 8·47	− ·08	− ·09	− ·01	3·9	3·3	1·79	− ·09	− ·09
67	+ ·09	+ ·01	−1·00	−1·60	− 2·56	+ ·23	+ ·23	+ ·27	5·3	2·4	1·65	+ ·21	+ ·23
68	+1·48	−4·00	−1·00	+ ·54	− ·29	− ·10	− ·11	− ·08	3·4	3·0	1·59	− ·16	− ·11
69	−1·85	+4·82	−1·00	+2·82	− 7·95	− ·14	− ·16	− ·20	6·6	3·0	2·06	− ·03	− ·03
70	−1·17	−1·87	−1·00	− ·36	− ·13	− ·18	− ·18	− ·16	8·2	3·2	2·30	− ·14	− ·10
71	− ·03	− ·01	−1·00	− ·20	− ·04	+ ·10	+ ·10	+ ·11	4·3	3·6	1·96	+ ·10	+ ·13
72	+ ·26	+ ·18	−1·00	− ·70	− ·49	+ ·10	+ ·11	+ ·13	3·9	3·7	1·90	+ ·09	+ ·13
73	− ·06	− ·01	−1·00	−1·90	− 3·61	+ ·07	+ ·07	+ ·13	2·3	3·4	1·37	+ ·05	+ ·09

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Equations to Determine the Definitive Corrections—*continued.*

Rotation No.	Coefficients of					O — C.			Weights.			Residuals.	
	u	w	x	y	z	n_1	n_2	n_3	p_o	p_c	p	r_1	r_2
						″	″	″				″	″
74	—0·04	—0·01	—1·00	+2·10	— 4·41	—0·11	—0·13	—0·13	7·1	4·8	2·86	—0·09	—0·05
75	— ·79	+1·19	—1·00	—1·25	— 1·56	— ·02	— ·02	+ ·06	1·8	3·5	1·19	·00	+ ·07
76	+ ·10	— ·03	—1·00	+2·61	— 6·81	— ·06	— ·09	— ·11	6·6	2·6	1·87	— ·04	— ·03
77	— ·01	·00	—1·00	—2·05	— 4·20	+ ·14	+ ·14	+ ·21	2·0	3·8	1·31	+ ·12	+ ·16
78	— ·07	— ·01	—1·00	+2·40	— 5·76	— ·11	— ·13	— ·14	5·0	3·1	1·91	— ·09	— ·06
79	— ·05	— ·02	—1·00	—2·44	— 5·95	+ ·38	+ ·38	+ ·45	1·8	3·7	1·21	+ ·36	+ ·38
80	+ ·30	+ ·09	—1·00	+ ·99	— ·98	— ·17	— ·17	— ·16	4·2	2·5	1·57	— ·17	— ·11
81	+ ·36	— ·85	—1·00	— ·48	— ·23	+ ·30	+ ·30	+ ·35	3·1	2·7	1·44	+ ·28	+ ·34
82	—1·14	+1·60	—1·00	— ·01	·00	— ·17	— ·17	— ·14	2·5	2·7	1·30	— ·13	— ·07
83	—1·56	+1·40	—1·00	—2·36	— 5·57	+ ·22	+ ·24	+ ·29	1·7	3·1	1·10	+ ·25	+ ·27
84	— ·29	— ·15	—1·00	— ·27	— ·07	— ·33	— ·33	— ·29	2·5	3·0	1·36	— ·33	— ·27
89	— ·98	+1·38	—1·00	+ ·66	— ·44	— ·26	— ·26	— ·26	5·1	3·1	1·93	— ·22	— ·18
90	·00	·00	—1·00	—1·72	— 2·96	— ·22	— ·22	— ·18	3·4	3·6	1·75	— ·24	— ·22
91	— ·79	+ ·32	—1·00	—2·79	— 7·78	— ·05	— ·06	+ ·03	2·3	3·4	1·37	— ·06	— ·04
92	— ·89	+1·42	—1·00	—2·17	— 4·71	+ ·07	+ ·06	+ ·15	2·1	2·9	1·22	+ ·08	+ ·12
93	+ ·45	+ ·13	—1·00	+ ·24	— ·06	— ·07	— ·07	— ·04	3·6	3·3	1·72	— ·08	— ·02
94	—1·13	+1·47	—1·00	+2·76	— 7·62	— ·05	— ·08	— ·09	8·0	3·0	2·18	— ·07	— ·04
95	—1·79	+5·02	—1·00	+ ·35	— ·12	— ·17	— ·17	— ·16	10·0	3·3	2·48	— ·08	— ·04
96	+ ·29	— ·14	—1·00	—1·53	— 2·34	— ·31	— ·31	— ·26	2·3	3·2	1·34	— ·33	— ·30
97	+ ·40	— ·16	—1·00	—3·06	— 9·36	+ ·02	— ·02	+ ·10	1·2	3·4	0·89	— ·02	— ·01
98	·00	·00	—1·00	+2·68	— 7·18	+ ·02	·00	— ·02	10·6	3·6	2·69	+ ·04	+ ·07
99	—1·68	+1·51	—1·00	—1·01	— 1·02	— ·17	— ·16	— ·12	6·1	3·6	2·26	— ·13	— ·08
100	+2·70	—5·13	—1·00	—2·73	— 7·45	+ ·22	+ ·21	+ ·28	4·8	3·6	2·06	+ ·09	+ ·09
101	— ·34	— ·07	—1·00	—1·50	— 2·25	+ ·07	+ ·07	+ ·11	2·4	3·4	1·41	+ ·06	+ ·09
102	+ ·05	+ ·03	—1·00	— ·45	— 0·20	— ·14	— ·14	— ·11	2·5	3·7	1·49	— ·15	— ·10
103	— ·58	— ·06	—1·00	—1·79	— 3·20	+ ·15	+ ·15	+ ·21	1·6	3·2	1·07	+ ·14	+ ·18
104	+ ·18	·00	—1·00	—1·16	— 1·35	+ ·09	+ ·09	+ ·13	3·6	4·4	1·98	+ ·07	+ ·11
105	— ·19	— ·08	—1·00	—2·78	— 7·73	+ ·12	+ ·10	+ ·16	3·8	2·5	1·51	+ ·10	+ ·07
106	— ·25	+ ·58	—1·00	— ·25	— ·06	— ·02	— ·02	·00	2·5	3·8	1·51	— ·01	+ ·03
107	— ·12	— ·10	—1·00	—1·38	— 1·90	— ·06	— ·06	— ·01	2·1	3·7	1·34	— ·07	— ·03
108	— ·70	+ ·07	—1·00	— ·06	·00	— ·04	— ·03	— ·01	2·4	3·7	1·46	— ·02	+ ·03
109	— ·64	+ ·32	—1·00	—2·44	— 5·95	+ ·02	+ ·01	+ ·12	2·0	3·5	1·27	+ ·01	+ ·07
110	— ·29	+ ·15	—1·00	+ ·29	— 0·8	— ·24	— ·24	— ·22	3·8	2·5	1·51	— ·23	— ·18
111	+ ·11	+ ·04	—1·00	—3·19	—10·18	— ·20	— ·21	— ·12	1·0	4·0	0·80	— ·23	— ·23
112	— ·10	— ·03	—1·00	+ ·41	— ·17	— ·27	— ·26	— ·24	2·8	3·8	1·61	— ·26	— ·20

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EQUATIONS TO DETERMINE THE DEFINITIVE CORRECTIONS—*continued.*

Rotation No.	Coefficients of					O — C.			Weights.			Residuals.	
	u	w	x	y	z	n_1	n_2	n_3	p_o	p_c	p	r_1	r_2
						″	″	″				″	″
115	—0·67	—0·13	—1·00	+1·81	— 3·28	+0·15	+0·14	+0·14	3·8	3·0	1·68	+0·18	+0·23
118	+ ·05	+ ·01	—1·00	+ ·99	— ·98	+ ·02	+ ·01	+ ·01	4·6	3·2	1·89	+ ·03	+ ·06
119	— ·83	+1·16	—1·00	—1·15	— 1·32	— ·14	— ·14	— ·09	3·6	3·4	1·75	— ·12	— ·07
120	+ ·20	+ ·04	—1·00	+ ·66	— ·44	+ ·12	+ ·12	+ ·14	3·9	3·1	1·73	+ ·12	+ ·18
122	— ·66	+ ·13	—1·00	+1·64	— 2·69	+ ·14	+ ·13	+ ·13	7·7	3·7	2·50	+ ·17	+ ·22
124	— ·20	— ·12	—1·00	—3·23	—10·43	+ ·06	+ ·04	+ ·11	2·8	4·0	1·65	+ ·03	·00
125	— ·38	— ·04	—1·00	— ·37	— ·14	+ ·11	+ ·12	+ ·15	2·4	3·1	1·35	+ ·12	+ ·17
126	— [illegible]	— ·11	—1·00	—3·00	— 9·00	— ·08	— ·10	·00	1·5	3·6	1·06	— ·10	— ·09
127	+ [illegible]	+ ·03	—1·00	+ ·06	·00	+ ·06	+ ·06	+ ·08	3·9	4·4	2·07	+ ·05	+ ·10
128	—2·[illegible]	+4·89	—1·00	+ ·97	— ·94	·00	— ·01	— ·01	2·6	3·1	1·41	+ ·11	+ ·15
129	— ·09	— ·04	—1·00	+ ·97	— ·94	— ·09	— ·08	— ·08	3·0	3·5	1·61	— ·08	— ·02
130	— ·08	— ·01	—1·00	— ·53	— ·28	— ·14	— ·14	— ·09	2·2	3·2	1·30	— ·14	— ·08
131	— ·56	— ·23	—1·00	—2·46	— 6·05	— ·23	— ·24	— ·15	1·4	2·6	0·91	— ·24	— ·21
132	+1·40	—1·68	—1·00	—1·82	— 3·31	+ ·07	+ ·06	+ ·13	1·8	3·3	1·16	+ ·01	— ·04
133	+ ·90	—1·17	—1·00	+2·40	— 5·76	— ·05	— ·07	— ·09	5·0	3·2	1·95	— ·06	— ·04
134	— ·87	— ·09	—1·00	—1·80	— 3·24	— ·06	— ·05	+ ·03	1·8	2·5	1·05	— ·06	+ ·01
137	+ ·06	— ·01	—1·00	+ ·01	·00	— ·20	— ·20	— ·17	3·4	3·2	1·65	— ·20	— ·14
138	— ·45	+ ·13	—1·00	—2·68	— 7·18	— ·24	— ·25	— ·17	2·1	3·5	1·31	— ·26	— ·24
139	+ ·27	— ·14	—1·00	—1·05	— 1·10	+ ·17	+ ·17	+ ·22	4·7	3·7	2·07	+ ·15	+ ·20
140	— ·40	— ·16	—1·00	+ ·11	— ·01	— ·15	— ·14	— ·12	3·5	3·2	1·67	— ·14	— ·08
141	—2·49	+4·99	—1·00	—1·82	— 3·31	+ ·11	+ ·11	+ ·16	5·9	3·5	2·20	+ ·19	+ ·22
142	— ·36	— ·07	—1·00	—2·07	— 4·28	— ·27	— ·27	— ·20	1·8	3·3	1·16	— ·28	— ·25
143	+ ·10	— ·01	—1·00	+3·40	—11·56	— ·03	— ·09	— ·16	9·6	3·4	2·51	·00	— ·06
144	—1·85	+4·62	—1·00	+1·40	— 1·96	— ·01	— ·01	— ·03	2·9	2·9	1·45	+ ·08	+ ·11
145	— ·37	— ·22	—1·00	—1·14	— 1·30	— ·11	— ·10	— ·06	2·0	3·0	1·20	— ·11	— ·07
146	+ ·09	+ ·01	—1·00	— ·57	— ·32	+ ·14	+ ·14	+ ·18	3·7	3·2	1·72	+ ·13	+ ·19
147	—1·45	+1·89	—1·00	— ·50	— ·25	+ ·18	+ ·19	+ ·24	2·2	3·1	1·29	+ ·23	+ ·30
148	— ·83	+1·16	—1·00	—2·04	— 4·16	— ·02	— ·02	+ ·06	2·7	3·0	1·42	— ·01	+ ·04
149	— ·55	— ·17	—1·00	+3·19	—10·18	+ ·11	+ ·08	+ ·02	6·2	2·9	1·98	+ ·15	+ ·13
152	+ ·09	— ·08	—1·00	—2·80	— 7·84	— ·30	— ·32	— ·22	2·3	2·8	1·26	— ·33	— ·31
153	— ·20	+ ·12	—1·00	—1·91	— 3·65	— ·15	— ·15	— ·08	2·1	3·2	1·27	— ·16	— ·12
154	+1·44	—1·44	—1·00	—1·52	— 2·31	+ ·28	+ ·28	+ ·33	4·3	3·6	1·96	+ ·22	+ ·25
155	+ ·15	+ ·12	—1·00	+0·44	— 0·19	— ·03	— ·03	— ·02	2·6	3·6	1·51	— ·03	+ ·02
156	— ·04	— ·03	—1·00	+1·09	— 1·19	+ ·02	+ ·02	+ ·01	4·5	3·9	2·09	+ ·03	+ ·07
157	—2·77	+4·99	—1·00	—3·05	— 9·30	— ·19	— ·22	— ·12	1·5	2·7	0·96	— ·11	— ·11

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Equations to Determine the Definitive Corrections—*concluded.*

Rotation No.	Coefficients of					O — C.			Weights.			Residuals.	
	u	w	x	y	z	n_1	n_2	n_3	p_o	p_c	p	v_1	v_3
						″	″	″				″	″
158	+1·73	−1·38	−1·00	−2·64	− 6·97	+0·10	+0·09	+0·16	5·1	3·2	1·97	+0·02	+0·03
159	+1·29	−1·55	−1·00	+0·66	− ·44	+ ·12	+ ·13	+ ·14	4·9	3·5	2·04	+ ·08	+ ·14
160	+ ·10	+ ·01	−1·00	−2·93	− 8·58	− ·12	− ·13	− ·02	1·6	3·0	1·04	− ·15	− ·12
161	− ·19	+ ·21	−1·00	−1·01	− 1·02	− ·11	− ·12	− ·06	4·7	3·9	2·13	− ·11	− ·06
164	+ ·35	− ·21	−1·00	+ ·85	− ·72	+ ·02	+ ·01	+ ·02	7·9	3·3	2·33	+ ·02	+ ·06
165	− ·09	+ ·06	−1·00	−1·00	− 1·00	+ ·13	+ ·14	+ ·19	2·1	3·5	1·31	+ ·12	+ ·18
166	− ·02	− ·01	−1·00	+1·98	− 3·92	+ ·11	+ ·10	+ ·07	6·5	4·5	2·66	+ ·13	+ ·15
167	+ ·40	+ ·16	−1·00	−2·40	− 5·76	− ·09	− ·10	− ·03	4·7	2·5	1·63	− ·12	− ·11
168	+ ·12	+ ·07	−1·00	+2·11	− 4·45	+ ·11	+ ·10	+ ·06	4·2	4·4	2·15	+ ·13	+ ·14
169	·00	·00	−1·00	−1·32	− 1·74	+ ·23	+ ·25	+ ·29	3·0	3·1	1·52	+ ·22	+ ·27
171	+ ·20	− ·14	−1·00	+1·95	− 3·80	− ·04	− ·05	− ·08	4·0	3·2	1·78	− ·03	− ·01
172	− ·50	+ ·05	−1·00	− ·03	·00	+ ·07	+ ·08	+ ·10	5·4	4·1	2·33	+ ·08	+ ·14
173	+1·81	−4·87	−1·00	+ ·17	− ·03	+ ·07	+ ·08	+ ·09	7·7	3·9	2·59	− ·01	+ ·04
174	+ ·30	− ·54	−1·00	− ·37	− ·14	+ ·09	+ ·10	+ ·12	6·1	4·6	2·62	+ ·07	+ ·12
175	+ ·06	+ ·05	−1·00	−1·29	− 1·66	+ ·11	+ ·11	+ ·16	1·8	3·8	1·22	+ ·10	+ ·14
176	+ ·56	·00	−1·00	+2·74	− 7·50	− ·23	− ·25	− ·27	6·1	3·8	2·34	− ·22	− ·20
177	− ·90	− ·09	−1·00	−2·57	− 6·60	+ ·24	+ ·23	+ ·33	1·5	3·6	1·06	+ ·23	+ ·27

Having regard to the weights in column p we obtain, by the method of least squares, the following normal equations,

						1.	2.	3.
+ 181·64 u	− 282·98 w	+ 38·38 x	− 2·74 y	+ 152·02 z	=	+ 6·63	+ 7·03	+ 6·05
− 282·98	+ 564·49	− 54·29	+ 28·21	− 254·71	=	− 11·60	− 12·68	− 11·62
+ 38·38	− 54·29	+ 261·09	+ 26·30	+ 768·46	=	+ 1·31	+ 2·38	− 3·94
− 2·74	+ 28·21	+ 26·30	+ 768·73	+ 268·87	=	− 7·02	− 8·78	− 24·32
+ 152·02	− 254·71	+ 768·46	+ 268·87	+ 4691·83	=	+ 4·48	+ 14·13	− 7·75

in which the absolute terms on the right hand side of the equations are derived from the values of n_1, n_2 and n_3 respectively.

The resulting values of the unknown quantities are

	1.		2.		3.			
u =	+ 0·02286	or	+ 0·01954	or	+ 0·02020	Weight	39·10	I.
w =	− ·00853		− ·01105		− ·00995	„	144·76	
x =	+ ·00004		− ·00409		− ·02683	„	133·17	
y =	− ·00883		− ·01190		− ·03145	„	744·94	
z =	+ ·00025		+ ·00313		+ ·00335	„	2359·88	

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If we omit all terms depending on the square of the star's magnitude, that is omit the normal in w and all terms in w, we get

	1.		2.		3.			
$u =$	+ ·03615	or	+ ·03676	or	+ ·03569	Weight	175·25	II.
$x =$	− ·00053		− ·00479		− ·02747	„	133·82	
$y =$	− ·00912		− ·01228		− ·03180	„	750·46	
$z =$	+ ·00039		+ ·00332		+ ·00352	„	2372·77	

If we omit also all terms depending on the square of the distance, that is omit the normal in z and all terms in z, we get

	1.		2.		3.			
$u =$	+ ·03624	or	+ ·03753	or	+ ·03651	Weight	175·94	III.
$x =$	+ ·00060		+ ·00473		− ·01735	„	252·04	
$y =$	− ·00962		− ·01144		− ·03091	„	765·83	

These three solutions all agree in giving practically the same corrections to the meridian results on account of magnitude, *i.e.*, for the range of magnitude included in the comparison stars, viz. :

Stars Mag.	Corresponding value of m.	Solution I.			Solution II.			Solution III.		
		1.	2.	3.	1.	2.	3.	1.	2.	3.
		″	″	″	″	″	″	″	″	″
5·7	− 2·3	−0·098	−0·103	−0·099	−0·083	−0·085	−0·082	−0·083	−0·086	−0·084
6·0	− 2·0	− ·080	− ·083	− ·082	− ·072	− ·073	− ·071	− ·072	− ·075	− ·073
7·0	− 1·0	− ·031	− ·030	− ·030	− ·036	− ·037	− ·036	− ·036	− ·038	− ·037
8·0	0·0	·000	·000	·000	·000	·000	·000	·000	·000	·000
8·5	+ 0·5	+ ·009	+ ·007	+ ·008	+ ·018	+ ·018	+ ·018	+ ·018	+ ·019	+ ·018

The following are the resulting corrections to the observed distances according to the various solutions.

Distance.	Coefficient of y.	Solution I.			Solution II.			Solution III.		
		1.	2.	3.	1.	2.	3.	1.	2.	3.
″		″	″	″	″	″	″	″	″	″
600	− 3·4	+0·033	+0·072	+0·119	+0·035	+0·075	+0·121	+0·031	+0·044	+0·088
1000	− 3·0	+ ·029	+ ·060	+ ·098	+ ·030	+ ·062	+ ·100	+ ·028	+ ·039	+ ·075
2000	− 2·0	+ ·019	+ ·032	+ ·050	+ ·019	+ ·033	+ ·050	+ ·019	+ ·028	+ ·044
3000	− 1·0	+ ·009	+ ·011	+ ·008	+ ·009	+ ·011	+ ·008	+ ·010	+ ·016	+ ·014
4000	0·0	·000	− ·004	− ·027	− ·001	− ·005	− ·027	+ ·001	+ ·005	− ·017
5000	+ 1·0	− ·009	− ·013	− ·055	− ·008	− ·014	− ·056	− ·008	− ·007	− ·048
6000	+ 2·0	− ·018	− ·015	− ·076	− ·015	− ·016	− ·077	− ·017	− ·018	− ·079
7000	+ 3·0	− ·024	− ·012	− ·091	− ·023	− ·012	− ·096	− ·027	− ·029	− ·110

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A glance at the values of n_1 and n_2 in the original equations shows that the corresponding corrections of columns 1 and 2 in the preceding table will produce residuals so nearly identical that it is unnecessary to perform the usual substitution for both cases to deduce the probable error.

If we substitute the values of u, w, x, y and z, derived from solution I_1 in the original equations, we obtain the residuals compared with n_1 which are given in column v_1; and

$$[p\,vv] = 5{\cdot}3127.$$

$$\epsilon^2 = \frac{[p\,vv]}{n-m} = 0{\cdot}0361\ ;\ \text{and}\ \epsilon = \pm 0''{\cdot}190.$$

If the values of u, w, x, y and z, obtained from solution I_3 are substituted on the left hand side of the original equations and the sum compared with n_3, we get the residuals which are given in column v_3; and

$$[p\,vv] = 5{\cdot}6422.$$

$$\epsilon^2 = \frac{[p\,vv]}{n-m} = 0{\cdot}0384\ ;\ \text{and}\ \epsilon = \pm\ 0''{\cdot}196.$$

As was to be expected, the advantage in accuracy is in favour of solution I_1, but the reason why this advantage is so small is *not* that the systematic corrections required by the various observers' results are purely accidental errors, but because all the corrections to the individual observers are so similar in character, and the observations so similarly distributed, that the mean results can be satisfied by systematic corrections to the mean, nearly as well as by systematic corrections to the results of each observer.

The definitive solution is therefore

$u = +{\cdot}0229''$	mean error	$\pm{\cdot}0304''$
$w = -{\cdot}0085$	,,	$\pm{\cdot}0157$
$x = \ {\cdot}0000$	,,	$\pm\ 0165$
$y = -{\cdot}0088$	,,	$\pm{\cdot}0070$
$z = +{\cdot}00025$	,,	$\pm{\cdot}0036$

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These constants seem so small compared with their mean errors that one may reasonably question their reality. If, however, we omit the terms w and z, that is accept the solution III., the results of which are practically identical with that of I., we have

$u = +\cdot 0362''$	mean error	$\pm\cdot 0143''$
$x = +\cdot 0060$	,,	$\pm\cdot 0120$
$y = -\cdot 0090$	,,	$\pm\cdot 0069$

From these results combined with the previous "Table of Systematic Corrections to reduce other Observers to Gill" (page 133) we obtain :—

TABLE VII.

A TABLE OF DEFINITIVE SYSTEMATIC CORRECTIONS TO BE APPLIED TO THE HELIOMETER MEASURES OF DISTANCE BY THE DIFFERENT OBSERVERS.

Distance.	Coefficient of y.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
″		″	″	″	″	″	″
600	− 3·4	+ ·03	+ ·08	+ ·30	+ ·19	+ ·29	+ ·13
1000	− 3·0	+ ·03	+ ·06	+ ·26	+ ·16	+ ·25	+ ·09
2000	− 2·0	+ ·02	+ ·02	+ ·14	+ ·09	+ ·15	+ ·01
3000	− 1·0	+ ·01	− ·01	+ ·04	+ ·03	+ ·06	− ·05
4000	0·0	·00	− ·04	− ·06	− ·03	− ·01	− ·10
5000	+ 1·0	− ·01	− ·07	− ·14	− ·08	− ·05	− ·13
6000	+ 2·0	− ·02	− ·09	− ·19	− ·12	− ·08	− ·16
7000	+ 3·0	− ·03	− ·11	− ·26	− ·13	− ·09	− ·17

The only other classes of systematic errors that remain for discussion are those which depend upon the direction of measurement.

It is already shewn (p. 134) that these errors cannot be a function of the parallactic angle, but, if they exist, must, for any pair, be a function of the difference between the position-angle of that pair and that of the Standard stars, or of that difference and the distance.

To ascertain if such errors exist in a sufficiently sensible degree to require their complete discussion, the values of the residuals v_1 in the preceding equations have been divided into two classes, viz. :—

Class A, in which the position-angle of the pair agrees within ± 45° with that of the Standard stars;

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Class B, in which the position-angle differs by more than 45° from that of the Standard stars;

and the mean values for both classes, having regard to the weight of each residual, have been taken.

Class A gives the mean value

$$v_A = +\ 0''\cdot007\ ;\ \text{weight } 168\cdot1\ ;\ \text{mean error} \pm 0''\cdot015\ ;$$

and Class B

$$v_B = -\ 0''\cdot018\ ;\ \text{weight } 93\cdot1\ ;\ \text{mean error} \pm 0''\cdot020.$$

The systematic errors depending on direction of measurement are therefore insensible.

It will be remarked that the definitive systematic corrections of the preceding table cannot, in the case of any observer, be entirely accounted for by an outstanding error in scale-value.

If it could be assumed that all Heliometer observers, in consequence of the peculiar form of the discs of stars presented by the segments of an object-glass, or from a common erroneous habit in their manner of causing the discs to pass through each other, do measure all distances too small (but by different amounts for different observers), then every observation by the same observer would require a correction

$$= \Delta x$$

but if a known standard distance $= \Sigma$ is observed, and all the observations are reduced on the supposition that Σ has been observed without error, then each other distance in the triangulation would require a further correction

$$= -\Delta x \frac{s}{\Sigma}$$

and the complete correction of each distance would be

$$\Delta x - \Delta x \frac{s}{\Sigma} = \Delta x \left(1 - \frac{s}{\Sigma}\right)$$

This hypothesis would account for the increasing positive corrections which have to be applied to the measures of diminishing distances, but it leaves unexplained the fact that the different observers require different corrections for distances nearly the same as that of the Standard stars, because when s is $= \Sigma$ the value of the co-efficient $\left(1 - \frac{s}{\Sigma}\right)$ is zero. The only hypothesis which can account for this fact is that the Standard stars

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are pointed on by some of the observers in a manner systematically different from the average of the other pairs; this may be explained by the considerable difference in colour of the components of the Standard pair.

We are thus forced to accept the fact that there are small constant peculiarities in an observer's habit of pointing which are different for different pairs of stars, and which are not eliminated by any number of observations by the same observer; hence we arrive at the following important practical conclusion, viz. :—

If it be required to determine the relative positions of the individual members of a group of stars with the highest possible accuracy, it is preferable to measure the distance of each star from the largest possible number of different stars, rather than to limit the same number of measures to a much smaller number of distances which have been selected so as best to satisfy the mere geometrical conditions of the problem.

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CHAPTER VII.

Determination of Definitive Weights for the Heliometer and Meridian Observations, and the Definitive Values of the Heliometer Observations of Distance.

The systematic corrections applicable to Heliometer observations made by the different observers (from Table VII. of the preceding chapter) were then applied to the results, and the mean observed distance was computed for each pair having regard to the preliminarily adopted weights (Chapter IV., Table IV.). The square of the mean error of an observation of weight *unity* was then computed from the *agreement* of the Heliometer results by the different observers for the same pair, as in the following Table VIII.

TABLE VIII.

Squares of Mean Errors of the Various Classes of Heliometer Observations, corresponding to Weight Unity, according to the System of Weights in Table IV.

Limits of Distance.	Magnitude 6·6 to 7·9			Magnitude 8·0 to 8·2			Magnitude 8·3 to 8·5			Mean.		
	$\frac{s}{1000}$	ϵ^2	No. of Pairs.	$\frac{s}{1000}$	ϵ^2	No. of Pairs.	$\frac{s}{1000}$	ϵ^2	No. of Pairs.	$\frac{s}{1000}$	ϵ^2	No. of Pairs.
Gill.												
0″ to 3000″	1·98	·0416	12	1·89	·0382	10	1·98	·0072	10	1·95	·0298	32
3000 to 5000	3·87	·0193	13	3·92	·0281	16	3·88	·0344	30	3·89	·0294	59
5000 to 7200	5·86	·0505	14	6·15	·0169	20	6·21	·0212	27	6·11	·0265	61
Mean	4·00	·0374		4·45	·0254		4·54	·0250				
Finlay.												
0″ to 3000″	1·98	·0322	12	1·89	·0252	10	1·98	·0177	10	1·95	·0255	32
3000 to 5000	3·87	·0193	13	3·92	·0287	16	3·85	·0337	29	3·87	·0291	58
5000 to 7200	5·86	·0511	14	6·15	·0181	20	6·21	·0312	27	6·11	·0314	61
Mean	4·00	·0347		4·45	·0233		4·53	·0303				
Jacoby.												
0″ to 3000″	2·11	·0288	9	1·80	·0075	7	2·03	·0581	9	1·99	·0334	25
3000 to 5000	3·89	·9307	8	3·79	·0226	12	3·84	·0318	17	3·83	·0286	37
5000 to 7200	5·72	·0743	8	6·28	·0550	11	6·17	·0377	20	6·11	·0501	39
Mean	3·83	·0440		4·24	·0310		4·50	·0395				

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TABLE VIII.—*continued.*

Limits of Distance.	Magnitude 6·6 to 7·9.			Magnitude 8·0 to 8·2.			Magnitude 8·3 to 8·5.			Mean.		
	$\frac{s}{1000}$	ε^2	No. of Pairs.	$\frac{s}{1000}$	ε^2	No. of Pairs.	$\frac{s}{1000}$	ε^2	No. of Pairs.	$\frac{s}{1000}$	ε^2	No. of Pairs.
						CHASE.						
0″ to 3000″	1·92	·0622	11	1·89	·0314	10	1·98	·0270	10	1·93	·0409	31
3000 to 5000	3·87	·0476	13	3·92	·0317	16	3·89	·0201	29	3·89	·0295	58
5000 to 7000	5·86	·0460	14	6·04	·0512	18	6·15	·0207	21	6·04	·0377	53
Mean	4·04	·0512		4·33	·0396		4·36	·0215				
						SCHUR.						
0″ to 3000″	1·99	·0230	8	0·60	·0053	1	1·99	·0296	6	1·90	·0245	15
3000 to 5000	3·73	·0309	10	3·92	·0142	6	3·82	·0332	23	3·81	·0297	39
5000 to 7200	6·10	·0335	7	5·89	·1131	3	6·24	·0500	19	6·17	·0525	29
Mean	3·84	·0291		4·18	·0430		4·55	·0394				
						AMBRONN.						
0″ to 3000″	1·84	·0045	5	2·04	·0580	9	1·98	·0243	4	1·97	·0356	18
3000 to 5000	4·14	·0783	5	3·92	·0345	12	3·77	·0595	8	3·92	·0513	25
5000 to 7200	5·64	·0970	9	6·17	·0207	15	6·17	·0463	9	6·03	·0485	33
Mean	4·25	·0677		4·39	·0346		4·46	·0471				

From these data it is evident that the previous adopted weights require sensible modification. For example, the weights assigned to Gill and Finlay's observations are too low, nearly by the proportion in which they were originally arbitrarily reduced, and Gill's observations of the brightest stars have received too high weight relative to the two classes of fainter stars.

In the case of Chase, the weights of his observations of the two brighter classes of stars have been overestimated, and the weight of the observations of the faintest class underestimated.

In Schur's observations the shorter distances have received too low weight, and the greater distances too high weight; and so on.

By careful discussion and successive approximation the following definitive system of weights was finally arrived at (Table IX.). For the reader's convenience the original approximate weights are given in the same Table in smaller type (and in brackets) below the corresponding definitive weights.

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TABLE IX.

Weight of a Single Normal Observation of Distance by each of the Heliometer Observers.

(Weight *unity* corresponds to an estimated *mean error* of $\pm 0''\cdot 2$.)

Distance.	Gill.		Finlay.	Jacoby.	Chase.		Schur.	Ambronn.
	Mag. 6·8 to 7·9.	Mag. 8·0 to 8·5.	All Stars.	All Stars.	Mag. 6·8 to 8·2.	Mag. 8·3 to 8·5.	All Stars.	All Stars.
600	3·53 (3·1)	3·53 (2·4)	3·20 (1·8)	0·80 (0·5)	0·61 (0·9)	0·61 (0·4)	1·70 (1·4)	1·21 (1·4)
1000	3·02 (2·7)	3·02 (2·0)	2·70 (1·5)	0·75 (0·5)	0·60 (0·8)	0·60 (0·4)	1·50 (1·2)	1·09 (1·2)
2000	2·03 (2·0)	2·03 (1·3)	1·79 (1·1)	0·57 (0·4)	0·55 (0·6)	0·55 (0·3)	1·02 (0·9)	0·80 (0·9)
3000	1·42 (1·3)	1·42 (0·9)	1·27 (0·9)	0·40 (0·3)	0·50 (0·5)	0·50 (0·3)	0·69 (0·6)	0·56 (0·6)
4000	1·07 (1·0)	1·07 (0·7)	0·97 (0·7)	0·30 (0·3)	0·45 (0·4)	0·45 (0·2)	0·50 (0·5)	0·43 (0·5)
5000	0·89 (0·8)	0·89 (0·6)	0·78 (0·6)	0·20 (0·2	0·39 (0·4)	0·39 (0·2)	0·35 (0·4)	0·35 (0·4)
6000	0·77 (0·7)	0·77 (0·5)	0·63 (0·5)	0·16 (0·2)	0·34 (0·3)	0·34 (0·2)	0·30 (0·4)	0·28 (0·4)
7000	0·67 (0·6)	0·67 (0·4)	0·52 (0·4)	0·14 (0·2)	0·30 (0·3)	0·30 (0·2)	0·27 (0·3)	0·25 (0·3)

The following definitive Table X. of the distances as measured by each observer was then computed by applying to the original observations the definitive systematic corrections (derived in the preceding chapter) and the corrections for proper motion to 1889·55. The definitive mean for each pair was then computed by combining the results of the different observers with weights derived from the above Table IX. Under each observer's result is given, in smaller type, the number of observations on which it depends (two observations of half weight counting as one, &c.), and the corresponding weight is given in brackets. For each pair the sum of the weights of the observations would be the weight of the mean observed distance were it not for the uncertainty of the corrections for proper motion to the epoch 1889·55. The sum of the weights is given (in brackets) below each mean observed distance. The true weight, allowing for the uncertainty of the correction for proper motion to 1889·55, is printed without inclusion in brackets. It will be remarked that in the case of some of the most accurately observed distances and where the proper motions are most uncertain, the modification of the original weight is very important. The computation of the

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modified weight was very easily effected, as follows :—The "square of the mean error" corresponding to any given "weight" was taken from a previously prepared table; to this was added the square of the mean error of the proper motion in distance,[1] and the weight corresponding to the sum so found was taken from the Table of "Weights" and "Squares of Mean Errors."

TABLE X.

TABLE OF HELIOMETER OBSERVATIONS OF DISTANCE (corrected for Proper Motion, Scale-value and Systematic Errors), with the corresponding distances computed from the normal places derived from the Meridian Observations.

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
1	f n	6464·57 2 (1·44)	5·10 2 (1·14)	5·93 1 (0·15)	4·79 3 (0·96)	4·84* 1 (0·29)	...	6464·846 (3·98) 3·8	6465·092 −0·246
2	f c	3407·11 1½ (1·86)	7·34 1 (1·15)	...	6·65 1 (0·48)	...	...	3407·123 (3·49) 3·1	3407·296 −0·173
3	p s	6357·70 2 (1·44)	8·15 2 (1·16)	...	7·93 2 (0·64)	7·75 1 (0·29)	8·45 1 (0·27)	6357·933 (3·80) 3·6	6358·031 −0·098
4	p l	5061·06 1 (0·89)	0·95 1 (0·78)	...	1·43 1 (0·39)	...	1·11 1 (0·35)	5061·092 (2·41) 1·9	5060·977 +0·115
5	q o	4222·78 1½ (1·55)	2·95 1½ (1·15)	...	2·85 2 (0·88)	2·93 2 (0·94)	...	4222·868 (4·52) 3·9	4223·018 −0·150
6	q t	3301·11 2¼ (2·88)	1·10 2¼ (2·66)	...	1·12 3 (1·44)	0·93 2 (1·28)	...	3301·081 (8·26) 7·4	3301·129 −0·048
7	e c	1577·42 2¼ (5·42)	7·28 1 (2·14)	...	7·35 2 (1·14)	7·53 2 (2·44)	...	1577·410 (11·14) 7·5	1577·292 +0·118
8	e E	5327·08 3½ (3·01)	6·97 2 (1·48)	...	7·16 3 (1·11)	...	7·19 1 (0·32)	5327·073 (5·92) 5·4	5327·258 −0·185
9	d a	3477·42 2 (2·44)	7·40 2 (2·26)	...	7·59 4 (1·92)	7·48 2 (1·20)	...	3477·465 (7·82) 6·3	3477·397 +0·068
10	d E	4788·71 3 (2·79)	8·76 2 (1·62)	8·96 1 (0·22)	8·51 3 (1·20)	...	8·42 1 (0·37)	4788·676 (6·20) 5·4	4788·766 −0·090
11	t r	3549·59 1½ (1·80)	9·69 3 (3·89)	...	9·66 3½ (1·41)	9·56 2 (1·18)	...	3549·645 (8·28) 7·4	3549·761 −0·116
12	t F	6721·40 2 (1·38)	1·17 2 (1·08)	...	1·81 2 (0·64)	...	1·14 1 (0·26)	6721·384 (3·36) 3·3	6721·643 −0·259

(1) The square of the mean error of the proper motion is thus found from Table V., column 16.

The square of the mean error of proper motion in any direction is for	Star *a*	·0004
Do. do. do.	Star *b*	·0005
The square of the mean error of the proper motion in distance (or in position-angle on the great circle) is		·0009

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
13	θ η	7280·73 2 (1·32)	0·67 1½ (0·77)	...	...	0·53 2 (0·52)	...	7280·672 (2·61) 2·55	7280·851 −0·179
14	θ κ	5950·25 2 (1·54)	0·05 1½ (0·95)	...	...	0·88 2 (0·60)	...	5950·311 (3·09) 3·0	5950·003 +0·308
15	λ θ	3404·36 2 (2·48)	3·89 1½ (1·73)	...	...	4·16 2 (1·22)	...	3404·165 (5·43) 5·1	3403·931 +0·234
16	λ κ	4433·84 4 (3·96)	3·96 3 (2·64)	...	4·15 2 (0·84)	4·11 1 (0·45)	...	4433·929 (7·89) 6·8	4433·770 +0·159
17	m k	1549·28 2 (4·86)	9·53 2 (4·34)	...	9·35 2 (1·14)	9·39 2 (2·46)	...	1549·392 (12·80) 9·8	1549·302 +0·090
18	m n	3696·85 2 (2·32)	6·56 2 (2·14)	...	6·39* 2 (0·92)	7·04 2 (1·12)	...	3696·722 (6·50) 6·15	3696·833 −0·111
19	z x	3345·90 1½ (1·58)	5·65 2 (2·34)	...	5·66 2 (0·96)	5·29 2 (1·24)	...	3345·643 (6·12) 3·8	3345·672 −0·029
20	z ε	3854·37 1½ (1·67)	4·49 1½ (1·53)	...	4·54 2 (0·92)	4·47 2 (1·06)	...	3854·456 (5·18) 3·5	3854·494 −0·038
21	x s	5843·43 1½ (1·20)	3·73 1½ (0·99)	...	3·78 2 (0·70)	...	3·56 1 (0·30)	5843·612 (3·19) 2·95	5843·450 +0·162
22	x ε	7099·88 3 (2·00)	100·06 2½ (1·16)	...	...	...	9·75 2 (0·50)	7099·919 (3·66) 3·4	7099·915 +0·004
23	k l	2995·50 1 (1·42)	5·73 1 (1·27)	5·81 1 (0·40)	5·35 1 (0·50)	..	5·79 1 (0·56)	2995·621 (4·15) 2·8	2995·541 +0·080
24	k i	1708·86 1 (2·29)	8·81 1 (2·02)	9·28 1 (0·59)	8·87 1 (0·56)	...	8·97 1 (0·88)	1708·899 (6·34) 3·2	1708·852 +0·047
25	y x	3019·38 1 (1·41)	9·66 1 (1·27)	9·58 1 (0·40)	9·34 1 (0·50)	...	9·51 1 (0·56)	3019·498 (4·14) 3·6	3019·536 −0·038
26	y γ	3425·69 1 (1·24)	6·18 1 (1·15)	6·26 1 (0·36)	6·24 1 (0·48)	...	5·28 1 (0·50)	3425·912 (3·73) 3·4	3425·596 +0·316
28	δ ζ	4930·48 1½ (1·36)	0·51 1 (0·79)	...	0·71 2 (0·78)	...	...	4930·549 (2·93) 2·4	4930·339 +0·210
29	ε γ	2734·23 ⅔ (1·16)	4·15 ¼ (0·35)	3·92 1 (0·44)	...	...	4·07 1 (0·62)	2734·127 (2·57) 2·5	2734·283 −0·156
30	ε θ	6401·91 2 (1·44)	1·81 2 (1·16)	...	1·86 2 (0·65)	1·94 2 (0·58)	...	6401·876 (3·83) 3·7	6401·931 −0·055
31	ζ α	6479·98 4½ (3·20)	9·75 2 (1·14)	...	80·07 2 (0·64)	...	9·97 1 (0·26)	6479·940 (5·24) 3·8	6479·910 +0·030
32	ζ κ	3970·37 4½ (4·84)	0·35 3 (2·94)	...	0·67 2 (0·90)	...	0·18 2 (0·86)	3970·375 (9·54) 5·8	3970·365 +0·010
33	g c	4383·24 ½ (0·50)	3·37 1 (0·89)	3·51 1 (0·26)	3·43 1½ (0·63)	...	...	4383·374 (2·28) 2·0	4383·393 −0·019

* An error of 1″ in Elkin's reduction of observation of August 27 was discovered after the equations for magnitude and scale value were solved.

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
34	g k	2095·44 1 (1·95)	5·40 1 (1·74)	5·73 1 (0·55)	5·58 1 (0·55)	...	5·15 1 (0·78)	2095·429 (5·57) 4·3	2095·371 +0·058
35	E b	6706·14 2 (1·38)	6·21 1 (0·54)	...	6·42 2 (0·62)	...	6·20 1 (0·26)	6706·221 (2·80) 2·7	6705·909 +0·312
36	E n	3986·43 2 (2·14)	6·37 1½ (1·45)	6·41 1 (0·30)	6·19 3 (1·35)	...	6·22 1 (0·43)	3986·341 (5·67) 5·4	3986·827 −0·486
37	F s	5715·42 4½ (3·66)	5·52 2½ (1·70)	...	5·53 4 (1·40)	...	5·00 1 (0·30)	5715·448 (7·06) 6·6	5715·522 −0·074
38	F α	4535·77 4 (3·92)	5·68 2½ (1·94)	...	5·91 4 (1·68)	...	6·03 1 (0·39)	4535·790 (7·93) 7·2	4535·620 +0·170
39	s n	6701·45 3¾ (2·59)	1·76 ¾ (0·40)	...	1·06 3 (0·93)	1·25 1 (0·28)	...	6701·380 (4·20) 3·9	6701·177 +0·203
40	s w	5505·62 2 (1·68)	5·90 2½ (1·60)	...	5·43 2 (0·70)	...	5·73 1 (0·31)	5505·701 (4·29) 3·7	5505·353 +0·348
41	r o	5623·77 1½ (1·24)	3·68 1¼ (0·88)	...	3·66 2 (0·72)	3·33 1 (0·34)	...	5623·673 (3·18) 2·9	5623·352 +0·321
42	r w	6687·21 1½ (1·04)	7·54 1½ (0·81)	...	7·24 3 (0·33)	...	7·23 1 (0·26)	6687·309 (3·04) 2·8	6687·288 +0·021
43	γ β	2087·27 1 (1·95)	7·67 1 (1·74)	7·26 1 (0·55)	7·20 1 (0·55)	...	7·89 1 (0·78)	2087·474 (5·57) 5·1	2087·346 +0·128
44	γ η	2458·00 1 (1·70)	7·94 1 (1·54)	8·16 1 (0·48)	8·12 1 (0·53)	...	8·34 1 (0·69)	2458·057 (4·94) 4·7	2458·318 −0·261
45	w β	4704·87 1¼ (1·19)	4·53 1 (0·82)	...	4·30 2 (0·82)	...	4·47 1 (0·38)	4704·590 (3·21) 2·9	4704·525 +0·065
46	w v	2294·55 1½ (2·70)	4·35 1 (1·63)	...	4·40 2 (1·06)	...	4·64 1 (0·73)	2294·481 (6·12) 5·1	2294·367 +0·114
47	n l	4176·34 2 (2·06)	6·26 1 (0·93)	...	6·41 1 (0·44)	...	5·97 1 (0·41)	4176·289 (3·84) 2·5	4176·380 −0·091
48	n o	5101·45 1¼ (1·11)	1·80 1½ (1·14)	...	1·11 2 (0·77)	...	2·08 1 (0·34)	5101·555 (3·36) 3·0	5101·777 −0·222
49	i h	2063·16 2½ (4·95)	3·55 ½ (0·88)	...	4·00 1 (0·55)	...	3·22 1 (0·79)	2063·279 (7·17) 3·6	2063·271 +0·008
50	b c	4594·53 2 (1·92)	4·27 2 (1·68)	...	4·26 2 (0·82)	...	4·25 1 (0·37)	4594·371 (4·79) 4·1	4594·281 +0·090
51	b a	2159·56 3 (5·73)	9·38 1 (1·70)	...	9·25 2 (1·08)	...	9·54 1 (0·76)	2159·489 (9·27) 7·7	2159·737 −0·248
52	f i	2553·46 1 (1·64)	3·14 1 (1·48)	3·28 1 (0·47)	2·90 1 (0·52)	2·88 1 (0·83)	...	2553·191 (4·94) 2·9	2553·325 −0·134
53	f a	6740·32 3 (2·07)	0·41 1 (0·53)	...	0·01 2 (0·60)	...	0·96 1 (0·26)	6740·328 (3·46) 3·2	6740·331 −0·003
54	p q	3224·87 4 (5·28)	5·27 1 (1·21)	...	4·93 3 (1·47)	4·89 1 (0·65)	5·26 1 (0·53)	3224·957 (9·14) 8·0	3224·901 +0·056
55	p k	4525·06 1 (0·98)	5·38 1 (0·86)	5·09 2 (0·50)	4·92 2 (0·84)	5·08 1 (0·44)	4·52 1 (0·38)	4525·054 (4·00) 3·6	4525·154 −0·100

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
56	q s	3413·73 3 (3·72)	3·88 1½ (1·73)	3·60 1 (0·36)	4·01 3 (1·44)	3·81 1 (0·61)	4·23 1 (0·50)	3413·839 (8·36) 7·3	3413·812 +0·027
57	q r	3398·51 3 (3·72)	8·69 1½ (1·73)	8·84 1 (0·36)	9·13 3 (1·44)	8·89 2 (1·22)	...	3398·721 (8·47) 7·5	3398·801 −0·080
58	e i	4651·77 1½ (1·44)	1·34 1 (0·83)	0·90 1 (0·23)	1·33 1 (0·41)	1·26 1 (0·42)	...	4651·484 (3·33) 2·2	4651·552 −0·068
59	e a	4387·22 1 (1·00)	7·60 ½ (0·45)	6·80 1 (0·26)	6·87 2 (0·86)	6·67 1 (0·45)	...	4387·059 (3·02) 2·8	4387·016 +0·043
60	d m	6940·73 3 (2·03)	0·82 1 (0·52)	0·51 1 (0·14)	1·10 3 (0·90)	1·11 2 (0·54)	...	6940·864 (4·13) 3·7	6941·040 −0·176
61	d b	2697·69 1 (1·57)	7·72 1 (1·40)	7·08 1 (0·48)	7·76 2 (1·03)	7·63 2 (1·56)	...	2697·645 (6·04) 5·0	2697·599 +0·046
62	t v	1821·72 1½ (3·26)	1·98 1 (1·92)	1·65 1 (0·60)	1·81 2 (1·12)	1·93 2 (2·22)	...	1821·832 (9·12) 8·2	1821·859 −0·027
63	t s	2850·07 2½ (3·75)	49·76 1½ (2·01)	49·59 1 (0·43)	50·23 3 (1·53)	50·12 2 (1·48)	...	2850·014 (9·20) 8·0	2850·084 −0·070
64	θ δ	3429·19 2 (2·48)	8·93 1 (1·15)	8·78 1 (0·36)	8·80 2 (0·96)	8·99 2 (1·22)	...	3429·017 (6·17) 5·55	3429·051 −0·034
65	θ ζ	4482·32 2 (1·98)	...	2·12 1 (0·25)	2·60 2 (0·84)	2·65 2 (0·89)	...	4482·441 (3·96) 3·2	4482·223 +0·218
66	λ μ	6914·01 4 (2·70)	4·01 1½ (0·78)	4·69 1 (0·14)	3·38 3 (0·90)	4·54 2 (0·54)	...	6913·973 (5·06) 4·7	6914·090 −0·117
67	λ ζ	5601·05 5 (4·15)	1·13 1⅔ (1·23)	...	1·47 2 (0·72)	1·49 2 (0·66)	...	5601·152 (6·76) 4·6	5600·973 +0·179
68	m o	3456·93 1 (1·23)	7·23 1 (1·14)	6·59 1 (0·36)	7·23 1 (0·48)	6·90 1 (0·60)	...	3457·021 (3·81) 3·5	3457·095 −0·074
69	m i	1175·31 1¼ (3·54)	5·14 1 (2·52)	...	4·97 1 (0·59)	5·10 1 (1·41)	...	1175·195 (8·06) 3·8	1175·307 −0·112
70	μ κ	4363·03 5½ (5·50)	2·76 1½ (1·34)	2·71 1 (0·26)	2·64 3 (1·29)	3·11 2 (0·90)	...	4362·936 (9·29) 8·5	4363·119 −0·183
71	z α	4202·53 3 (3·09)	2·56 1¼ (1·15)	...	2·54 2 (0·88)	2·62 2 (0·94)	...	4202·551 (6·06) 3·8	4202·462 +0·089
72	z w	4699·62 2 (1·90)	9·62 2 (1·66)	...	9·47 2 (0·82)	9·53 2 (0·84)	...	4699·582 (5·22) 3·3	4699·496 +0·086
73	x α	5898·72 2 (1·58)	8·62 1 (0·65)	8·87 1 (0·16)	9·00 2 (0·69)	...	...	5898·769 (3·08) 2·85	5898·732 +0·037
74	x w	1896·29 2 (4·22)	6·17 1¼ (2·33)	...	6·12 2 (1·11)	...	5·86 2 (1·66)	1896·163 (9·32) 6·7	1896·223 −0·060
75	k n	5245·37 ½ (0·22)	5·10 1 (0·75)	5·04 1 (0·19)	5·45 1 (0·38)	...	5·18 1 (0·32)	5245·211 (1·86) 1·75	5245·251 −0·040
76	k h	1385·39 1 (2·59)	5·60 1 (2·32)	5·83 1 (0·67)	5·71 2 (1·16)	...	5·48 1 (0·97)	1385·551 (7·71) 6·3	1385·578 −0·027
77	y α	6052·36 1½ (1·14)	2·35 1 (0·62)	...	2·17 1 (0·34)	...	2·62 1 (0·28)	6052·361 (2·38) 2·2	6052·258 +0·103

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
78	y β	1596·57 1 (2·39)	6·91 1 (2·12)	6·74 1 (0·63)	6·60 1 (0·57)	...	6·92 1 (0·91)	1596·746 (5·62) 5·6	1596·833 −0·087
79	δ η	6443·72 1½ (1·08)	3·73 1 (0·58)	...	3·56 1 (0·32)	...	3·95 1 (0·26)	6443·726 (2·24) 2·1	6443·391 +0·335
80	δ α	3006·04 2 (2·84)	5·85 1 (1·27)	6·42 1 (0·40)	5·88 2 (1·00)	...	6·03 1 (0·56)	3005·998 (6·07) 5·2	3006·163 −0·165
81	ε ι	4476·90 ½ (0·49)	6·86 1½ (1·30)	7·35 1 (0·25)	6·58 2 (0·84)	...	6·37 1 (0·39)	4476·773 (3·27) 3·1	4476·465 +0·308
82	ε β	4014·83 1¼ (1·34)	4·54 1 (0·97)	...	4·94 1 (0·45)	...	4·94 1 (0·43)	4014·772 (3·19) 3·0	4014·961 −0·189
83	g n	6364·07 1¼ (0·90)	4·04 1 (0·58)	...	4·62 1 (0·32)	...	4·52 1 (0·27)	6364·205 (2·07) 1·9	6364·030 +0·175
84	g l	4265·56 1½ (1·53)	5·10 1 (0·91)	...	5·38 1 (0·44)	...	5·97 1 (0·41)	4265·460 (3·29) 2·4	4265·829 −0·369
85	E m	4915·90 3 (2·73)	5·55 2 (1·60)	5·68 1 (0·21)	5·46 3 (1·18)	...	5·90 1 (0·35)	4915·715 (6·07) 6·0	4916·320 −0·605
86	E c	6890·01 1½ (1·01)	89·74 1¼ (0·66)	...	90·14 2 (0·60)	...	89·78 1 (0·25)	6889·947 (2·52) 2·4	6890·211 −0·264
87	F z	5054·16 1½ (1·33)	4·36 1 (0·77)	3·77 1 (0·20)	4·22 2 (0·78)	...	4·49 1 (0·35)	5054·229 (3·43) 3·25	5054·314 −0·085
88	F v	5242·02 2 (1·74)	1·85 1½ (1·12)	...	2·01 2 (0·76)	...	2·08 1 (0·33)	5241·975 (3·95) 3·9	5242·093 −0·118
89	s v	3336·49 2 (2·54)	6·13 1½ (1·76)	...	6·17 2 (0·96)	6·66 1 (0·62)	...	3336·348 (5·88) 5·4	3336·623 −0·275
90	s r	5718·81 2 (1·63)	8·38 1½ (1·02)	...	8·80 2 (0·72)	8·19 1 (0·32)	...	5718·635 (3·69) 3·5	5718·876 −0·241
91	γ w	6786·04 2 (1·36)	6·10 1 (0·53)	6·51 1 (0·14)	5·80 2 (0·60)	...	5·96 1 (0·25)	6786·017 (2·88) 2·6	6786·096 −0·079
92	n h	6170·99 1 (0·74)	0·18 1 (0·60)	0·57 1 (0·16)	0·83 1 (0·33)	...	0·56 1 (0·28)	6170·646 (2·11) 2·05	6170·604 +0·042
93	a c	3762·90 2 (2·26)	2·89 2 (2·08)	2·79 2 (0·64)	3·10 2½ (1·15)	...	3·20 1 (0·45)	3762·942 (6·58) 5·3	3763·035 −0·093
94	v u	1237·62 2 (5·52)	7·74 1 (2·46)	7·62 1 (0·70)	7·74 2 (1·18)	...	7·59 1 (1·02)	1237·657 (10·88) 9·3	1237·682 −0·025
95	f m	3651·85 4½ (5·27)	1·93 4 (4·34)	1·97 2 (0·68)	1·80 3 (1·41)	2·04 1 (0·57)	...	3651·888 (12·27) 10·8	3652·058 −0·170
96	f l	5525·77 2 (1·68)	6·02 2 (1·43)	...	5·97 1 (0·36)	...	6·34 1 (0·30)	5525·929 (3·77) 2·8	5526·276 −0·347
97	p u	7056·46 1 (0·67)	5·88 1 (0·52)	5·73 1 (0·14)	...	...	6·14 1 (0·25)	7056·154 (1·58) 1·5	7056·139 +0·015
98	p o	1317·34 2 (5·36)	7·37 1 (2·40)	7·34 1 (0·69)	7·52 2 (1·17)	7·57 1 (1·35)	7·45 1 (1·00)	1317·399 (11·97) 8·7	1317·355 +0·044
99	q v	5013·72 4 (3·56)	4·00 3½ (2·73)	3·65 1 (0·20)	3·88 3 (1·17)	3·92 1 (0·39)	3·43 1 (0·35)	5013·829 (8·40) 7·55	5014·000 −0·171

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
100	q m	6731·63 4 (2·75)	1·68 3½ (1·88)	1·36 1 (0·14)	1·81 4 (1·22)	1·74 2 (0·55)	...	6731·681 (6·54) 6·2	6731·484 +0·197
101	e k	5504·17 2 (1·68)	4·10 1 (0·71)	...	4·05 2 (0·73)	3·65 1 (0·34)	..	5504·079 (3·46) 3·0	5503·988 +0·091
102	e b	4452·02 1 (0·99)	1·56 1 (0·88)	1·68 1 (0·26)	1·84 2 (0·84)	1·79 1 (0·45)	...	4451·801 (3·42) 3·1	4451·930 −0·129
103	d i	5785·26 1 (0·80)	5·50 1 (0·66)	4·89 1 (0·16)	...	5·12 1 (0·31)	...	5785·289 (1·93) 1·5	5785·125 +0·164
104	t x	5162·50 2 (1·74)	2·24 2 (1·50)	2·99 1 (0·19)	2·44 1 (0·38)	2·35 1 (0·37)	...	5162·410 (4·18) 3·8	5162·360 +0·050
105	λ δ	6776·43 4½ (3·06)	6·42 1¾ (0·93)	6·33 1 (0·14)	6·85 2 (0·60)	6·03 2 (0·55)	...	6776·432 (5·28) 4·6	6776·318 +0·114
106	m l	4247·72 1 (1·02)	7·85 1 (0·91)	8·10 1 (0·28)	8·29 1 (0·44)	8·08 1 (0·47)	...	4247·927 (3·12) 2·42	4247·975 −0·048
107	z δ	5383·13 2 (1·70)	3·51 1 (0·73)	3·35 1 (0·19)	3·46 1 (0·37)	...	...	5383·278 (2·99) 2·3	5383·358 −0·080
108	z γ	4064·44 1 (1·06)	4·56 1 (0·96)	4·45 1 (0·30)	5·14 1 (0·45)	4·69 1 (0·49)	...	4064·610 (3·26) 2·5	4064·627 −0·017
109	x γ	6444·21 1 (0·72)	3·94 1 (0·58)	3·56 1½ (0·23)	3·76 1 (0·32)	...	4·27 1 (0·26)	6444·004 (2·11) 2·0	6443·985 +0·019
110	k o	3707·62 1½ (1·73)	7·18 ½ (0·53)	7·38 1 (0·32)	7·35 1 (0·46)	7·62 1 (0·56)	7·60 1 (0·46)	3707·511 (4·06) 3·4	3707·769 −0·258
111	y δ	7193·13 1 (0·66)	3·55 1 (0·51)	2·63 1 (0·14)	...	...	...	7193·240 (1·31) 1·25	7193·426 −0·186
112	y w	3593·99 1 (1·19)	3·94 1 (1·10)	4·65 1 (0·34)	4·25 1 (0·47)	...	4·20 1 (0·47)	3594·099 (3·57) 3·0	3594·388 −0·289
115	g i	2190·93 1 (1·87)	0·72 1 (1·68)	0·57 1 (0·53)	0·87 1 (0·54)	...	0·64 1 (0·75)	2190·782 (5·37) 2·9	2190·593 +0·189
116	E i	4314·13 1 (1·02)	3·95 1 (0·91)	3·80 1 (0·27)	4·41 1 (0·43)	...	4·53 1 (0·40)	4314·139 (3·03) 2·2	4314·644 −0·505
117	F x	3544·98 1 (1·20)	5·13 1½ (1·68)	4·96 1 (0·35)	5·51 1 (0·47)	...	5·86 1 (0·48)	3545·199 (4·18) 3·9	3545·650 −0·451
118	s u	3010·51 2 (2·84)	0·56 1 (1·27)	0·69 1 (0·40)	0·62 2 (1·00)	0·62 1 (0·69)	...	3010·562 (6·20) 5·5	3010·537 +0·025
119	r v	5154·06 2 (1·74)	3·56 1 (0·75)	5·03 1 (0·20)	4·15 2 (0·76)	...	3·89 1 (0·33)	5154·015 (3·78) 3·6	5154·185 −0·170
120	w u	3343·82 2 (2·55)	4·30 ½ (0·58)	3·70 1 (0·36)	3·79 2 (0·96)	...	3·94 1 (0·51)	3343·874 (4·96) 4·2	3343·739 +0·135
122	f e	2358·39 3½ (6·16)	8·26 1½ (2·40)	8·36 1 (0·50)	8·46 3 (1·59)	...	8·46 1 (0·71)	2358·375 (11·36) 8·9	2358·220 +0·155
124	q w	7231·36 4 (2·64)	1·14 1 (0·51)	1·33 1 (0·14)	...	1·77 1 (0·27)	1·71 1 (0·25)	7231·381 (3·81) 3·4	7231·382 −0·001
125	e h	4373·64 1 (1·00)	3·46 1 (0·89)	3·57 1 (0·26)	3·56 1 (0·43)	3·95 1 (0·45)	...	4373·616 (3·03) 2·8	4373·525 +0·091

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
126	d k	7000·76 1 (0·67)	0·65 1 (0·52)	0·56 1 (0·14)	1·16 1 (0·30)	0·33 1 (0·27)	...	7000·717 (1·90) 1·8	7000·780 −0·063
127	t w	3939·30 1½ (1·62)	9·75 ½ (0·48)	9·24 1 (0·30)	9·31 1 (0·45)	9·44 1 (0·50)	...	3939·381 (3·35) 3·0	3939·354 +0·027
128	m g	3026·49 1 (1·41)	6·87 1 (1·26)	6·70 1 (0·40)	6·31 1 (0·50)	6·02 1 (0·69)	...	3026·525 (4·26) 3·7	3026·510 +0·015
129	z β	3026·61 1 (1·41)	7·03 1 (1·26)	6·39 1 (0·40)	7·24 1 (0·50)	7·25 1 (0·69)	...	3026·891 (4·26) 3·1	3026·981 −0·090
130	x β	4534·57 1 (0·98)	4·55 1 (0·86)	4·82 1 (0·24)	4·81 1 (0·41)	...	5·03 1 (0·37)	4534·679 (2·86) 2·7	4534·865 −0·186
131	k c	6464·75 1 (0·71)	4·78 1 (0·57)	...	4·57 1 (0·31)	...	4·69 1 (0·26)	6464·721 (1·85) 1·7	6464·970 −0·249
132	y v	5823·30 1½ (1·20)	3·57 ½ (0·33)	3·52 1 (0·16)	3·24 1 (0·35)	...	...	5823·351 (2·04) 1·9	5823·286 +0·065
133	ε η	1598·91 1 (2·39)	8·65 1 (2·12)	8·90 1 (0·63)	8·94 1 (0·57)	...	8·95 1 (0·91)	1598·834 (6·62) 6·0	1598·886 −0·052
134	g o	5803·04 1 (0·80)	3·09 1 (0·66)	3·05 1 (0·17)	3·05 1 (0·35)	...	3·07 1 (0·29)	5803·061 (2·27) 2·0	5803·141 −0·080
135	E h	...	6·98 1 (0·62)	6·66 1 (0·16)	7·31 1 (0·34)	...	7·46 1 (0·28)	6077·120 (1·40) 1·4	6077·312 −0·192
136	F w	5152·96 3 (2·62)	2·95 1 (0·75)	2·80 1 (0·20)	3·01 2 (0·77)	...	...	5152·960 (4·34) 3·9	5153·283 −0·323
137	r u	3991·05 1½ (1·60)	0·91 1 (0·97)	1·25 1 (0·30)	1·06 1 (0·45)	...	1·06 1 (0·43)	3991·032 (3·75) 3·5	3991·247 −0·215
138	f b	6678·48 1 (0·69)	8·75 1 (0·53)	9·43 1 (0·14)	8·43 1 (0·30)	...	8·61 1 (0·25)	6678·634 (1·91) 1·8	6678·901 −0·267
139	p r	5049·04 2 (1·78)	8·69 1½ (1·17)	8·84 1 (0·20)	8·76 3 (1·17)	8·43 1 (0·39)	8·00 1 (0·35)	5048·767 (5·06) 4·7	5048·593 +0·174
140	q u	3889·18 1½ (1·65)	9·15 1 (1·00)	8·72 1 (0·31)	9·09 2 (0·90)	8·85 1 (0·50)	8·83 1 (0·43)	3889·061 (4·79) 4·5	3889·174 −0·113
141	e m	5819·63 4 (3·20)	9·81 3½ (2·31)	9·92 1 (0·16)	9·81 5 (1·75)	9·93 2 (0·62)	...	5819·750 (8·04) 6·9	5819·673 +0·077
142	d h	6069·48 2 (1·52)	9·52 2 (1·24)	9·67 1 (0·16)	9·45 1 (0·34)	9·39 1 (0·30)	...	6069·492 (3·56) 3·2	6069·778 −0·286
143	t u	601·99 ½ (1·76)	1·84 2 (6·40)	1·91 1 (0·80)	1·62 2 (1·22)	1·76 2 (3·40)	...	601·824 (13·58) 11·1	601·802 +0·022
144	m h	2602·62 ½ (0·41)	2·91 1 (1·45)	2·51 1 (0·46)	2·73 1 (0·52)	2·69 1 (0·81)	...	2602·753 (3·65) 3·5	2602·743 +0·010
145	z η	5138·29 1 (0·88)	8·89 1 (0·76)	8·71 1 (0·19)	8·13 1 (0·39)	8·60 1 (0·39)	...	5138·518 (2·61) 2·1	5138·674 −0·156
146	x u	4573·00 2 (1·92)	2·92 1 (0·84)	2·65 1 (0·24)	3·20 2 (0·82)	2·92 1 (0·43)	3·05 1 (0·37)	4572·999 (4·62) 4·1	4572·880 +0·119
147	y ε	4504·59 1 (0·98)	4·67 1 (0·86)	5·00 1 (0·25)	4·87 1 (0·42)	...	4·82 1 (0·38)	4504·720 (2·89) 2·7	4504·567 +0·153

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TABLE X.—*continued.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
148	ε α	6038·29 2 (1·54)	7·90 1 (0·63)	8·29 1 (0·16)	8·43 1 (0·34)	...	7·69 1 (0·28)	6038·166 (2·95) 2·8	6038·196 −0·030
149	g h	814·69 1 (3·28)	4·57 1 (2·91)	4·36 1 (0·76)	4·62 1 (0·60)	4·73 1 (1·60)	...	814·627 (9·15) 6·8	814·486 +0·141
150	E k	6020·09 1 (0·77)	0·09 ½ (0·31)	0·33 1 (0·16)	9·57 1 (0·34)	...	0·27 1 (0·28)	6020·043 (1·86) 1·8	6020·581 −0·538
151	F y	5914·06 1 (0·78)	3·83 1 (0·64)	3·63 1 (0·16)	3·68 1 (0·34)	...	3·55 1 (0·28)	5913·838 (2·20) 2·1	5914·559 −0·721
152	f o	6796·00 1 (0·68)	5·85 2 (1·06)	6·03 1 (0·14)	5·35 2 (0·60)	5·80 1 (0·27)	...	6795·782 (2·75) 2·5	6796·100 −0·318
153	p h	5910·53 1 (0·78)	0·57 1 (0·64)	0·58 1 (0·16)	0·52 1 (0·34)	...	9·69 1 (0·28)	5910·437 (2·20) 2·1	5910·554 −0·117
154	q n	5517·70 3 (2·52)	7·68 2 (1·43)	7·40 1 (0·18)	7·69 3 (1·08)	7·80 2 (0·68)	...	5517·696 (5·89) 5·4	5517·438 +0·258
155	e g	3560·68 1 (1·20)	0·91 1 (1·11)	0·81 1 (0·34)	1·14 1 (0·47)	0·93 1 (0·59)	...	3560·859 (3·71) 3·2	3560·883 −0·024
156	d c	2910·63 2 (2·94)	0·65 1 (1·31)	0·20 1 (0·41)	1·17 2 (1·00)	0·81 2 (1·44)	...	2910·721 (7·10) 5·3	2910·695 +0·026
157	m c	7050·46 1 (0·67)	0·89 1 (0·52)	49·99 1 (0·14)	0·17 1 (0·30)	0·72 1 (0·27)	...	7050·534 (1·90) 1·8	7050·745 −0·211
158	z v	6640·66 4½ (3·14)	0·67 3 (1·64)	0·21 1 (0·14)	0·54 5 (1·55)	0·08 1 (0·28)	0·55 1 (0·26)	6640·600 (7·01) 4·3	6640·513 +0·087
159	x v	3340·99 2 (2·52)	0·80 1 (1·17)	0·56 1 (0·36)	0·52 2 (0·97)	0·47 1 (0·62)	0·64 1 (0·51)	3340·773 (6·15) 5·5	3340·605 +0·168
160	y u	6933·87 1 (0·67)	4·04 1 (0·52)	4·03 1 (0·14)	3·66 1 (0·30)	...	3·93 1 (0·25)	6933·903 (1·88) 1·8	6934·052 −0·149
161	ε δ	5012·46 3½ (3·11)	2·00 2 (1·56)	1·75 2 (0·40)	2·24 1 (0·39)	...	2·42 2 (0·70)	5012·279 (6·16) 5·3	5012·391 −0·112
162	E g	5741·29 1 (0·81)	1·40 1 (0·67)	1·15 1 (0·17)	0·94 1 (0·35)	...	1·49 1 (0·29)	5741·284 (2·29) 2·1	5741·516 −0·232
163	F u	6289·38 2 (1·47)	9·42 1 (0·60)	9·33 1 (0·16)	9·41 1 (0·33)	...	9·38 1 (0·28)	6289·389 (2·84) 2·8	6289·498 −0·109
164	f k	3150·28 2½ (3·38)	0·40 2 (2·45)	0·34 1 (0·38)	0·34 3 (1·47)	0·26 2 (1·32)	...	3150·322 (9·00) 7·1	3150·282 +0·040
165	p i	5001·87 1 (0·89)	1·69 1 (0·78)	2·25 1 (0·20)	2·19 1 (0·39)	...	2·21 1 (0·35)	5001·939 (2·61) 1·8	5001·880 +0·059
166	e d	2018·15 2 (4·06)	8·20 1 (1·79)	7·92 1 (0·57)	7·86 2 (1·10)	8·26 2 (2·04)	...	2018·136 (9·56) 6·9	2018·018 +0·118
167	θ α	6404·45 3½ (2·52)	4·30 3 (1·74)	4·40 1 (0·15)	4·47 4 (1·28)	3·92 2 (0·58)	...	6404·362 (6·27) 5·7	6404·435 −0·073
168	z y	1890·64 1 (2·11)	0·80 1 (1·86)	0·44 1 (0·59)	0·86 1 (0·55)	0·33 1 (1·07)	...	1890·635 (6·18) 3·8	1890·485 +0·150
169	y η	5320·08 2 (1·72)	0·17 1 (0·74)	9·61 1 (0·19)	0·50 2 (0·75)	...	9·96 1 (0·32)	5320·148 (3·72) 3·4	5319·931 +0·217

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TABLE X.—*concluded.*

Rotation No.	Stars.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.	Mean Observed Distance. / Weights.	Computed Distance. / O — C
		″	″	″	″	″	″	″	″
170	E f	5042·20 2 (1·78)	2·34 2½ (1·94)	2·28 1 (0·20)	2·31 3 (1·17)	...	2·48 1 (0·35)	5042·295 (5·44) 5·2	5042·837 −0·542
171	f h	2049·90 ¼ (0·50)	9·76 1½ (2·64)	9·90 1 (0·57)	9·84 1 (0·55)	9·73 1 (1·02)	...	2049·791 (5·28) 4·85	2049·813 −0·022
172	f d	4029·53 3 (3·20)	9·65 2 (1·93)	8·95 1 (0·30)	9·62 1 (0·45)	9·54 1 (0·50)	9·07 1 (0·43)	4029·516 (6·81) 5·6	4029·423 +0·093
173	p m	3827·96 3¾ (4·20)	7·86 2½ (2·55)	8·15 1 (0·32)	7·71 2 (0·92)	8·16 1 (0·54)	8·29 1 (0·45)	3827·941 (8·98) 8·2	3827·888 +0·053
174	p n	4366·13 3½ (3·50)	6·04 2½ (2·23)	...	5·94* 4 (1·72)	...	...	4366·059 (7·45) 6·7	4365·939 +0·120
175	d g	5290·39 1 (0·86)	89·80 1 (0·74)	91·02 1 (0·19)	...	0·09 1 (0·36)	...	5290·192 (2·15) 1·95	5290·098 +0·094
176	f g	1260·50 1½ (4·11)	0·35 1 (2·45)	0·96 1 (0·70)	0·58 1 (0·59)	...	0·45 1 (1·01)	1260·494 (8·16) 6·7	1260·703 −0·209
177	p g	6574·43 1 (0·70)	4·87 1 (0·55)	4·16 1 (0·15)	5·31 1 (0·31)	...	5·64 1 (0·26)	6574·830 (1·97) 1·8	6574·657 +0·173

* An error 1″·27 was found in Elkin's reduction of Chase's observation of July 18 after the equations for magnitude and scale-value were solved. The observation (previously rejected) is now retained; the mean observed value, with the original weights, becomes 4366″·068 instead of 4366″·034, in consequence of the change of Elkin's mean value from 4365″·77 to 4365″·94.

In order to compute the weights of the Meridian observations from comparison with the Heliometer observations :—

Let $[\varepsilon_o\ \varepsilon_o]$ be = the sum of the squares of the mean errors of the observed distances, computed from the preceding Table of Weights.

$[\varepsilon_\mu\ \varepsilon_\mu]$ = the sum of the squares of the mean errors of the corrections for proper motion.

$[\varepsilon_c\ \varepsilon_c]$ = the sum of the squares of the mean errors of the tabular distances, computed from Auwers' estimate of the mean errors of the Meridian observations in Right Ascension and Declination.

$[v\ v]$ = the sum of the squares of the differences between the distances derived from the Heliometer and Meridian distances.

If all these are correctly estimated we should have

$$[\varepsilon_o\ \varepsilon_c] + [\varepsilon_\mu\ \varepsilon_\mu] + [\varepsilon_c\ \varepsilon_c] = [v\ v]$$

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or if the preceding Table of Weights for the Heliometer measures is accurate, and the mean errors of the proper motions are estimated with sufficient precision, we have

$$[\varepsilon_c\ \varepsilon_c] = [v\ v] - \{[\varepsilon_c\ \varepsilon_o] + [\varepsilon_\mu\ \varepsilon_\mu]\}$$

and the factor by which the adopted weights of the Meridian observations have to be multiplied is

$$\frac{[v\ v] - \{[\varepsilon_o\ \varepsilon_o] + [\varepsilon_\mu\ \varepsilon_\mu]\}}{[\varepsilon_c\ \varepsilon_c]}$$

of which the numerical equivalent from the subsequently stated values of $[v\ v]$, &c., is

$$\frac{1{\cdot}7437}{1{\cdot}8687} = 0{\cdot}933$$

It is, however, desirable to distinguish between the weights in Right Ascension and Declination. For this purpose the observations are divided into two classes, viz. :—

Class A, where the position-angle is within 45° of 90° or 270°

„ B, „ „ „ 0° or 180°

The sums of the squares of the errors were found to be as follows :—

	Class A.	Class B.
$[\varepsilon_o\ \varepsilon_o] + [\varepsilon_\mu\ \varepsilon_\mu]$ =	1·1661	0·6058
$[\varepsilon_c\ \varepsilon_c]$ =	1·2408	0·6279
$[v\ v]$ =	2·1619	1·3537

whence

	Class A.	Class B.
$\dfrac{[v\ v] - \{[\varepsilon_o\ \varepsilon_o] + [\varepsilon_\mu\ \varepsilon_\mu]\}}{[\varepsilon_c\ \varepsilon_c]}$ =	0·802	1·19

in other words the tabular distances, which depend chiefly on the Right Ascensions, have received weights which are too high, and those which depend chiefly on the Declinations weights which are too low.

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To determine the relations which the above factors bear to the factors by which the adopted weights of the Right Ascensions and Declinations should be multiplied, the means of the squares of the coefficients of all the distances in Right Ascension and Declination were computed, and found to be :—

——	Mean Square of the Coefficient in R.A.	Mean Square of the Coefficient in Dec.
Class A	0·849	0·151
„ B	0·228	0·772

Hence, if a and d are the true factors by which the previously adopted weights of the Right Ascensions and Declinations should respectively be multiplied, we have the equations

$$0{\cdot}849a + 0{\cdot}151d = 0{\cdot}802$$

$$0{\cdot}228 + 0{\cdot}772 = 1{\cdot}19$$

whence

$$a = 0{\cdot}71$$

$$d = 1{\cdot}33$$

that is to say, the weights of the Right Ascensions of Table V., column 17, should be multiplied by 0·71, and the weights of the Declinations of column 18 of the same Table should be multiplied by 1·33.

The Right Ascensions and Declinations from the meridian observations are accordingly employed in the final equations with the weights of columns 17 and 18 of Table V. modified as above.

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CHAPTER VIII.

The Position-Angles.—Cape Observations.

In all observations of position-angle the results of measures of the Standard stars have been regarded as the final control on the instantaneous index-error of the position-circle. This method avoids the necessity for a frequent revision of the equatorial adjustments, because, at the same hour-angle, small changes in these adjustments produce nearly the same effect for all pairs included in the triangulation.

Adopting Chauvenet's Notation, the total correction applicable to any measured position-angle is

	The adopted values are
$\Delta p + \psi\ [\sin\phi \cos\delta - \cos\phi \sin\delta \cos\tau]$ - - - -	$\psi = \pm 21''\cdot 2$
$+\xi \sin\tau \sec\delta$ - - - - - - -	$\xi = +27''\cdot 3$
$-\eta \cos\tau \sec\delta$ - - - - - - -	$\eta = +26''\cdot 1$
$\pm i_1 \sec\delta$ - - - - - - - -	$i_1 = -25''\cdot 4$
$\mp c \tan\delta$ - - - - - - - -	$c = -\ 6''\cdot 5$
$-e \cos\phi \tan\delta \sin\tau$ - - - - - -	$e = +\ 3''\cdot 7$

The upper sign applies to tube preceding, the lower to tube following.

Δp was adopted $= -35'\ 43''$ as an approximately true value.

ψ was obtained with great accuracy from observations on the position-angles of the Iris Standard stars, made in two positions of the instrument, near the meridian, on 16 nights in November and December 1889.

ξ, η and e were derived from observations of the Declination of α Orionis and α Pictoris near the meridian on 1890 February 8, and of the stars ξ Hydræ and α Phœnicis near the 6^h circle on the following evening. Each star was observed both Tube E and Tube W and with a reversal of 180° in position-angle in each position.

i_1 is $= i - \epsilon \sin\phi$.

ϵ was deduced $= -59''\cdot 4$, by observing the hour-angles of a number of circumpolar stars on 1889 March 5, one star of each pair being near upper culmination and one near lower culmination, and both having nearly the same N.P.D. (*see* Chauvenet, Vol. II., Art. 256, page 387). The same series of observations gives $\eta = -26''\cdot 1$ which

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agrees closely with the value obtained from Declination observations already described. The same observations combined with the hour-circle observations on 1890 February 8 and 9, give $i = +7''\cdot8$ and $c = -6''\cdot5$.

The corrections applicable to the instrumental results, on account of errors of the adjustments, may be conveniently tabulated as follows.*

TABLE XI.

CORRECTIONS APPLICABLE TO THE POSITION-ANGLES FOR ERROR OF THE EQUATORIAL ADJUSTMENT FOR THE STANDARD STARS.

Sidereal Time.	Correction.	Sidereal Time.	Correction.
h m	′ ″	h m	′ ″
16 0	− 35 44	20 20	− 36 40
30	44	50	36
17 0	43	21 20	31
30	43	50	26
18 0	42	22 20	21
30	40	50	16
19 0	− 35 37	23 20	− 36 12

FOR THE TRIANGULATION GENERALLY.

East Hour-Angles.	Corrections.		West Hour-Angles.	Corrections.	
	Decl. − 4°	Decl. − 9°		Decl. − 4°	Decl. − 9°
h m	′ ″	′ ″	h m	′ ″	′ ″
1 0	− 35 39	− 35 37	1 0	− 36 37	− 36 42
1 30	41	38	1 30	32	37
2 0	42	39	2 0	28	32
2 30	43	41	2 30	23	26
3 0	44	42	3 0	18	21
3 30	44	42	3 30	13	16
4 0	− 35 44	− 35 42	4 0	− 36 9	− 36 11

The following Table XII. contains the results of all observations of position-angle of the Standard stars made at the Cape. Column 6 of this Table gives the corrections required on account of the errors in the equatorial adjustment taken from the above table. Column 10 gives the excess of the adopted tabular position-angle over the corresponding observed values in column 9, and values of C − O in that column are the true corrections to be applied to the other observations of position-angle in order to reduce them all to a common system. It was also found by trial that in this way the other observations come out in better accord than when the equatorial adjustments are

* Throughout the Triangulation the Tube was always in the *following* position for western hour-angles, and *preceding* for eastern.

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assumed constant over long periods of time, and corrections are derived by combining all the observations of the Standard stars and finding corrections depending on the sine and cosine of the hour-angle.

The two methods were compared by finding the mean error of the personal equation Gill – Finlay in observing position-angles. Using the corrections of column 11, Table XIII., the mean error of an observation of position-angle of weight unity, when the distance is 1000″, was found to be

$$\pm 51''\cdot 9$$

But when the index-error was derived on the assumption that the equatorial adjustment remains stable for several months, the same mean error was

$$\pm 58''\cdot 3.$$

The observations have therefore been entirely reduced by employing the instantaneous correction derived from the observations of the Standard stars.

TABLE XII.

Position-Angles—Cape Observations of Standard Stars.

Adopted Tabular Position-Angle 277° 11′ 52″ for Equinox 1889·0. Epoch 1889·55. Annual proper motion + 0″·6. Precession — 18″·2.

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Corrections for Equatorial Adjustments.	Refraction.	Aberration, Precession, and Proper Motion.	Corrected Position-Angle. Eq. 1889·0.	Correction to Standard C—O.
		1889.	h m	′ ″	′ ″	″	″	° ′ ″	″
1p	G	Sept. 1	18 7·5	47 26·0	— 35 41	— 14·2	+ 7·1	277 11 38	+ 14
10p	G	Sept. 3	17 26·2	47 27·1	— 35 42	— 25·8	+ 7·1	11 26	+ 21
16	G	3	18 30·1	47 17·8	— 35 40	— 9·4	+ 7·1	11 36	
17	G	Sept. 3	21 35·5	47 51·7	— 36 29	+ 22·2	+ 7·1	11 52	0
25	G	3	23 20·3	46 42·6	— 36 12	+ 74·5	+ 7·1	11 52	
27	G	Sept. 6	17 39·7	47 35·8	— 35 42	— 21·3	+ 7·2	11 40	+ 10
33	G	6	18 54·8	47 18·8	— 35 37	— 4·9	+ 7·2	11 44	
35	G	Sept. 6	21 21·4	47 55·8	— 36 31	+ 19·5	+ 7·2	11 51	— 2
43	G	6	22 59·0	47 7·0	— 36 15	+ 57·1	+ 7·2	11 56	
45	G	Sept. 8	17 45·5	47 36·8	— 35 42	— 20·0	+ 7·2	11 42	+ 8
51	G	8	18 54·7	47 20·4	— 35 37	— 4·9	+ 7·2	11 46	
53	G	Sept. 8	21 17·8	47 53·6	— 36 31	+ 18·4	+ 7·2	11 48	+ 4
59	G	Sept. 10	18 2·7	47 30·4	— 35 42	— 15·3	+ 7·3	11 40	+ 12
63	G	Sept. 10	21 13·3	47 46·6	— 36 32	+ 17·9	+ 7·3	11 40	+ 12
71	G	Sept. 11	21 18·5	47 55·9	— 36 31	+ 18·6	+ 7·3	11 51	+ 5
79	G	11	22 53·2	46 59·4	— 36 16	+ 52·3	+ 7·3	11 43	

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TABLE XII.—*continued.*

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Corrections for Equatorial Adjustments.	Refraction.	Aberration, Precession, and Proper Motion.	Corrected Position-Angle. Eq. 1889·0.	Correction to Standard C—O.
		1890.	h m	′ ″	′ ″	″	″	° ′ ″	″
374	F	June 18	21 44·7	47 34·0	— 36 27	+ 23·4	+ 21·6	277 11 52	— 9
377	F	18	22 50·4	47 12·7	— 36 16	+ 50·7	+ 21·6	12 9	
383	G	June 19	22 8·5	47 21·8	— 36 23	+ 32·1	+ 21·6	11 52·	— 2
387	G	19	23 15·8	46 35·6	— 36 12	+ 69·8	+ 21·6	11 55	
389	G	June 23	21 59·7	47 17·4	— 36 24	+ 28·8	+ 22·0	11 44	+ 4
393	G	23	23 14·8	46 33·1	— 36 12	+ 68·5	+ 22·0	11 52	
394	F	June 24	22 4·2	47 40·4	— 36 24	+ 30·4	+ 22·0	12 9	— 13
398	F	24	23 21·0	46 37·7	— 36 12	+ 74·6	+ 22·0	12 2	
399	G	June 28	16 10·8	48 6·7	— 35 44	— 70·0	+ 22·4	11 35	+ 16
403	G	28	17 17·7	47 25·1	— 35 43	— 28·5	+ 22·4	11 36	
1122	G	Oct. 13	20 43·9	47 43·7	— 36 37	+ 12·1	+ 26·7	11 46	+ 10
1127	G	13	22 0·7	47 5·0	— 36 24	+ 29·2	+ 26·7	11 37	
1134	G	Oct. 15	20 43·1	47 50·0	— 36 37	+ 11·7	+ 26·7	11 51	+ 2
1138	G	15	21 55·5	47 20·1	— 36 25	+ 27·1	+ 26·7	11 49	
1144	G	Oct. 17	20 50·5	47 35·5	— 36 36	+ 13·1	+ 26·7	11 39	+ 2
1149	G	17	21 51·9	47 27·7	— 36 26	+ 26·6	+ 26·7	11 55	
1154	G	17	22 49·0	46 54·4	— 36 16	+ 49·8	+ 26·7	11 55	
1170	G	Oct. 19	20 56·8	47 42·4	— 36 35	+ 14·1	+ 26·7	11 48	+ 4
1175	G	19	21 59·3	47 14·9	— 36 24	+ 28·4	+ 26·7	11 46	
1180	G	19	23 5·5	46 36·2	— 36 14	+ 60·2	+ 26·7	11 49	
1181	G	Oct. 22	21 21·5	47 35·9	— 36 31	+ 18·8	+ 26·8	11 50·	+ 6
1186	G	22	22 42·4	46 46·8	— 36 17	+ 45·3	+ 26·8	11 42	
1200	F	Oct. 24	21 40·7	47 27·2	— 36 28	+ 23·6	+ 26·8	11 50	— 4
1205	F	24	22 37·6	46 56·9	— 36 18	+ 43·4	+ 26·8	11 51	
1210	F	24	23 32·3	46 20·6	— 36 9	+ 87·2	+ 26·8	12 6	
1213	G	Oct. 25	21 36·2	47 22·6	— 36 28	+ 22·4	+ 26·8	11 44	+ 8
1229	G	Oct. 30	23 25·8	46 23·2	— 36 11	+ 78·8	+ 26·9	11 58	— 6
1231	F	Nov. 3	22 4·9	47 38·1	— 36 23	+ 30·0	+ 26·9	12 12	— 11
1236	F	3	23 6·6	46 39·9	— 36 14	+ 60·6	+ 26·9	11 53	
1240	F	Nov. 4	22 4·3	47 19·1	— 36 23	+ 29·9	+ 27·0	11·53	— 14
1245	F	4	23 12·2	46 58·9	— 36 13	+ 65·1	+ 27·0	12·18	
1248	F	Nov. 6	22 18·7	47 13·5	— 36 21	+ 34·7	+ 27·0	11·54	— 3
1253	F	6	23 24·0	46 22·4	— 36 11	+ 77·0	+ 27·0	11·55	
1255	F	Nov. 7	22 24·7	47 1·4	— 36 20	+ 37·2	+ 27·0	11·46	+ 7
1259	F	7	23 13·5	46 24·0	— 36 13	+ 66·1	+ 27·0	11·44	

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The following Table XIII. gives the results of the Cape observations of position-angle for all the pairs observed.

Column 11 gives the additional correction for index-error derived from the observed angles of the Standard stars, *i.e.*, the corresponding corrections of column 10 of Table XII.

The observations of position-angle do not seem to be so much affected in accuracy as those of distance by the quality of the definition, and half weight has only been assigned for the very worst definition. Such cases are marked ($\frac{1}{2}$).

TABLE XIII.

Results of Observations of Position-Angle in the Triangulation.

Pair 14. θ and κ. $\mu_p = -1''\cdot98$

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition. I. S.	Correction.
		1890	h m	° ′ ″	′ ″	″	″	° ′ ″		″
1148	G	Oct. 17	21 41·2	346 8 45	− 36 35	− 7·0	+ 28·7	345 32 31·7	2–3 : 3	+ 2
1177	G	„ 19	22 31·1	8 50	− 36 25	− 17·9	+ 28·5	32 36	3 : 3	+ 4
1207	F	Oct. 24	23 2·2	346 8 57	− 36 16	− 30·1	+ 28·6	32 39	1–2 : 2	− 4
1254	F	Nov. 6	23 38·5	9 21	− 36 14	− 54·0	+ 28·6	32 42	2 : 3–4	− 3

Pair 15. λ and θ. $\mu_p = -1''\cdot94$

		1890								
1152	G	Oct 17	22 27·3	298 32 56	− 36 25	+ 17·9	+ 28·6	297 57 17	2 : 2–3	+ 2
1178	G	„ 19	22 43·2	32 43	− 36 23	+ 19·3	+ 28·7	57 8	3 : 3	+ 4
1208	F	Oct. 24	23 13·2	298 32 17	− 36 18	+ 23·2	+ 28·5	56 51	1–2 : 2	− 4
1251	F	Nov. 6	22 56·2	32 15	− 36 21	+ 20·7	+ 28·5	56 43	2 : 3	− 3

Pair 16. λ and κ. $\mu_p = -2''\cdot05$

		1889								
49	G	Sept. 8	18 33·6	20 35 53	− 35 39	+ 4·9	+ 7·8	20 0 27	2 : 2–3	+ 8
		1890								
1156	G	Oct. 17	23 13·8	20 36 32	− 36 18	− 15·5	+ 28·7	0 27	3 : 3	+ 2

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TABLE XIII.—*continued.*

Pair 31. ζ and a. $\mu_p = +0''\cdot76$

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition. I. S.	Correction.
		1889	h m	° ′ ″	′ ″	″	″	° ′ ″		″
19	G	Sept. 3	22 3·3	319 26 14	− 36 29	+ 2·6	+ 7·6	318 49 55	2–3 : 3	0

Pair 53. f and a. $\mu_p = -0''\cdot49$

37	G	1889 Sept. 6	21 46·5	239 11 43	− 36 25	+ 15·2	+ 7·5	238 35 41	2–3 : 3	− 2

Pair 60. d and m. $\mu_p + 2''\cdot32$

		1890								
1124	G	Oct. 13	21 14·1	239 2 21	− 36 31	+ 5·9	+ 25·1	238 26 21	3 : 3	+ 10
1136	G	„ 15	21 12·0	2 20	− 36 31	+ 5·3	+ 25·1	(½) 26 19	4 : 4	+ 2
1146	G	„ 17	21 16·9	2 24	− 36 31	+ 6·5	+ 25·1	26 25	2–3 : 3	+ 2
1173	G	„ 19	21 38·5	2 17	− 36 27	+ 11·3	+ 25·1	26 26	3 : 3	+ 4
1201	F	Oct. 24	21 52·9	239 2 17	− 36 25	+ 15·5	+ 25·2	238 26 33	1–2 : 2	− 4
1235	F	Nov. 3	22 54·4	1 37	− 36 15	+ 45·0	+ 25·3	26 32	2–3 : 3	− 11
1242	F	„ 4	22 29·8	1 46	− 36 19	+ 29·8	+ 25·3	26 22	3 : 3	− 14
1250	F	„ 6	22 42·7	1 58	− 36 17	+ 37·0	+ 25·3	26 43	2–3 : 2–3	− 3

Pair 65. θ and ζ. $\mu_p - 2''\cdot30$

		1890								
1151	G	Oct. 17	22 17·4	208 3 59	− 36 27	− 7·8	+ 29·1	207 27 53	2 : 2–3	+ 2
1179	G	„ 19	22 53·8	3 39	− 36 20	− 8·2	+ 29·1	27 40	3 : 3	+ 4
1212	F	Oct. 24	23 54·2	208 3 34	− 36 10	− 11·9	+ 29·0	27 41	1–2 : 2	− 4
1247	F	Nov. 4	23 39·6	3 30	− 36 12	− 2·3	+ 29·1	27 45	3 : 3	− 14

Pair 66. λ and μ. $\mu_p = -0''\cdot93$

		1889								
23	G	Sept. 3	22 55·7	342 42 45	− 36 21	− 23·2	+ 7·8	162 6 9	2–3 : 3	0
		1890								
384	G	June 19	22 28·4	342 42 35	− 36 26	− 14·3	+ 23·3	6 18	2 : 2	− 2
392	G	„ 23	22 55·1	42 38	− 36 21	− 22·9	+ 23·6	6 18	1–2 : 1–2	+ 4
402	G	„ 28	16 56·6	41 19	− 35 42	+ 18·6	+ 24·1	6 20	3 : 2–3	+ 16
1153	G	Oct. 17	22 36·5	42 12	− 36 25	− 16·4	+ 27·5	5 58	2 : 2–3	+ 2
1216	G	„ 25	22 17·8	42 29	− 36 29	− 11·5	+ 27·5	6 16	3 : 3–4	+ 8
1227	G	„ 30	23 8·4	42 37	− 36 21	− 28·3	+ 27·5	6 15	2–3 : 3	− 6
375	F	June 18	22 3·2	342 42 52	− 36 31	− 8·5	+ 23·2	6 36	1–2 : 2–3	− 9
395	F	„ 24	22 24·1	42 48	− 36 28	− 13·1	+ 23·8	6 31	2 : 3	− 13

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TABLE XIII.—*continued.*

Pair 67. λ and ζ. $\mu_p = -3''\cdot09$

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition. I. S.	Correction.
		1889	h m	° ′ ″	′ ″	″	″	° ′ ″		″
55	G	Sept. 8	21 39·8	65 26 21	− 36 34	+ 9·3	+ 7·7	64 50 4	3 : 3	+ 4
		1890								
1155	G	Oct. 17	23 4·0	65 25 28	− 36 20	+ 38·9	+ 29·8	50 17	3 : 3	+ 2
1185	G	„ 22	22 28·6	25 39	− 36 25	+ 22·4	+ 29·7	50 6	3–4 : 3–4	+ 6
1209	F	Oct. 24	23 23·2	65 25 6	− 36 16	+ 51·8	+ 31·7	50 14	1–2 : 2	− 4
1233	F	Nov. 3	22 30·7	25 47	− 36 25	+ 23·3	+ 32·8	50 18	2–3 : 3	− 11

Pair 70. μ and κ. $\mu_p = -0''\cdot33$

		1889								
12	G	Sept. 3	17 48·9	304 10 38	− 35 40	− 13·6	+ 7·9	303 34 52	2 : 3	+ 21
29	G	„ 6	18 3·4	10 53	− 35 39	− 10·1	+ 8·0	35 12	2 : 3	+ 10
		1890								
385	G	June 19	22 44·7	304 10 42	− 36 24	+ 13·4	+ 22·9	34 54	2 : 2	− 2
391	G	„ 23	22 35·3	10 49	− 36 26	+ 13·0	+ 23·3	34 59	1–2 : 1–2	+ 4
401	G	„ 28	16 38·5	10 43	− 35 42	− 42·3	+ 23·7	34 42	2–3 : 2–3	+ 16
1225	G	Oct. 30	22 52·5	10 32	− 36 23	+ 13·3	+ 26·7	34 49	2–3 : 3	− 6
376	F	June 18	22 23·6	304 10 47	− 36 28	+ 12·7	+ 22·8	34 55	1–2 : 2–3	− 9
397	F	„ 24	23 4·0	10 49	− 36 21	+ 13·7	+ 23·4	35 5	2 : 3	− 13

Pair 71. z and α. $\mu_p = +2''\cdot16$

		1890								
1123	G	Oct. 13	20 57·3	357 37 27	− 36 39	− 6·3	+ 24·7	357 1 6	3 : 3	+ 10
1139	G	„ 15	22 8·6	37 22	− 36 26	− 18·9	+ 24·7	(½) 1 2	4 : 4	+ 2
1150	G	„ 17	22 7·2	37 32	− 36 26	− 18·9	+ 24·7	1 12	2–3 : 3	+ 2
1215	G	„ 25	22 2·3	37 38	− 36 27	− 17·6	+ 24·7	1 18	3 : 3–4	+ 8
1204	F	Oct. 24	22 27·5	357 37 46	− 36 23	− 24·9	+ 24·7	1 23	1–2 : 2	− 4
1244	F	Nov. 4	22 59·7	37 28	− 36 18	− 38·4	+ 24·8	0 56	3 : 3	− 14
1252	F	„ 6	23 12·3	38 10	− 36 16	− 46·0	+ 24·8	1 33	2–3 : 3	− 3
1258	F	„ 7	23 1·5	37 52	− 36 17	− 39·5	+ 24·8	1 20	2–3 : 3	+ 7

Pair 81. ε and ι. $\mu_p = -0''\cdot46$

		1890								
386	G	June 19	22 59·3	243 41 45	− 36 19	+ 35·6	+ 22·0	243 6 24	2 : 2	− 2
390	G	„ 23	22 18·1	42 26	− 36 26	+ 17·5	+ 22·4	6 40	1–2 : 1–2	+ 4
400	G	„ 28	16 22·3	42 16	− 35 44	− 31·8	+ 22·7	6 23	2–3 : 2–3	+ 16
396	F	June 24	22 42·5	243 42 24	− 36 22	+ 26·9	+ 22·4	6 51	2 : 3	− 13

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TABLE XIII.—*continued.*

Pair 85. E and m. $\mu_p = +3''\cdot90$

Rotation Number.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition. I. S.	Correction.
		1890	h m	° ′ ″	′ ″	″	″	° ′ ″		″
1137	G	Oct. 15	21 36·6	195 22 8	− 36 28	− 16·1	+ 23·8	(½) 194 45 48	4 : 4	+ 2
1147	G	„ 17	21 28·1	22 20	− 36 29	− 15·2	+ 23·8	46 0	2–3 : 3	+ 2
1172	G	„ 19	21 24·9	22 33	− 36 29	− 14·6	+ 23·8	46 13	3 : 3	+ 4
1184	G	„ 22	22 5·6	22 8	− 36 23	− 21·1	+ 23·8	45 48	3–4 : 3–4	+ 6
1202	F	Oct. 24	22 6·9	195 22 28	− 36 23	− 21·7	+ 23·8	46 7	1–2 : 2	− 4
1237	F	Nov. 3	23 15·9	22 39	− 36 12	− 47·7	+ 24·0	46 3	3–4 : 3–4	− 11
1243	F	„ 4	22 44·3	22 0	− 36 17	− 31·8	+ 24·0	45 35	3 : 3	− 14
1257	F	„ 7	22 50·1	22 12	− 36 16	− 34·1	+ 24·0	45 46	2–3 : 2–3	+ 7

Pair 95. f and m. $\mu_p = +3''\cdot22$

77	G	1889 Sept. 11	22 32·5	265 44 20	− 36 18	+ 49·5	+ 7·4	265 8 59	3 : 3	+ 5

Pair 96. f and l. $\mu_p = +0''\cdot60$

41	G	1889 Sept. 6	22 38·2	35 32 15	− 36 17	− 4·7	+ 7·2	214 56 1	2–3 : 3	− 2

Pair 100. q and m. $\mu_p = -1''\cdot78$

67	G	1889 Sept. 10	22 0·9	267 22 39	− 36 24	+ 31·1	+ 7·4	266 45 54	3 : 3	+ 12

Pair 105. λ and δ. $\mu_p = +1''\cdot10$

73	G	1889 Sept. 11	21 47·8	291 11 58	− 36 32	+ 17·4	+ 7·6	290 35 51	3 : 3	+ 5
		1890								
1174	G	Oct. 19	21 49·2	291 11 44	− 36 32	+ 17·3	+ 25·5	35 55	2–3 : 2–3	+ 4
1230	G	„ 30	23 43·6	10 44	− 36 12	+ 46·3	+ 25·5	35 44	2–3 : 3	− 6
1211	F	Oct. 24	23 43·5	291 10 45	− 36 12	+ 46·8	+ 25·5	35 45	1–2 : 2	− 4
1234	F	Nov. 3	22 42·6	11 19	− 36 22	+ 26·0	+ 25·5	35 49	2–3 : 3	− 11

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TABLE XIII.—*continued.*

Pair 116. E and i. $\mu_p = -2''\cdot15$

Rotation No.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition. I. S.	Correction.
		1890	h m	° ′ ″	′ ″	″	″	° ′ ″		″
1126	G	Oct. 13	21 46·3	2 47 48	− 36 27	− 20·2	+ 29·9	2 11 31	3-4 : 3-4	+ 10

Pair 122. f and e. $\mu_p = -2''\cdot80$

69	G	1889 Sept. 10	22 30·6	236 9 39	− 36 19	+ 28·0	+ 7·5	235 33 56	3 : 3	+ 12

Pair 124. q and w. $\mu_p = -0''\cdot20$

61	G	1889 Sept. 10	18 26·3	272 34 40	− 35 40	− 12·5	+ 7·3	271 58 55	1-2 : 2-3	+ 12
65	G	„ 10	21 33·4	34 54	− 36 30	+ 20·7	+ 7·3	58 52	1-2 : 2-3	+ 12

Pair 138. f and b. $\mu_p = -0''\cdot03$

75	G	1889 Sept. 11	22 10·1	220 39 56	− 36 21	+ 2·2	+ 7·6	220 3 45	2-3 : 2-3	+ 5

Pair 161. ε and δ. $\mu_p = +2''\cdot22$

1171	G	1890 Oct. 19	21 10·0	187 4 50	− 36 37	− 9·2	+ 24·7	186 28 29	2-3 : 2-3	+ 4
1176	G	„ 19	22 19·5	4 59	− 36 25	− 20·6	+ 24·7	28 38	3 : 3	+ 4
1182	G	„ 22	21 35·3	5 9	− 36 32	− 12·4	+ 24·5	28 49	3-4 : 3-4	+ 6
1214	G	„ 25	21 48·9	5 10	− 36 31	− 14·7	+ 24·5	28 49	3 : 3-4	+ 8
1203	F	Oct. 24	22 17·7	187 5 2	− 36 25	− 20·4	+ 24·5	28 41	1-2 : 2	− 4
1238	F	Nov. 3	23 28·1	5 24	− 36 14	− 48·5	+ 24·6	28 46	3-4 : 3-4	− 11
1246	F	„ 4	23 26·9	5 39	− 36 14	− 47·7	+ 24·6	29 2	3 : 3	− 14
1256	F	„ 7	22 38·1	4 53	− 36 22	− 25·6	+ 24·6	28 30	2-3 : 2-3	+ 7

Pair 164. f and k. $\mu_p = +3''\cdot34$

57	G	1889 Sept. 8	22 2·7	240 48 9	− 36 23	+ 19·8	+ 7·4	240 12 13	3 : 3	+ 4

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TABLE XIII.—*concluded.*

Pair 170. E and f. $\mu_p = -0''\cdot57$

Rotation No.	Observer.	Date.	Sidereal Time.	Instrumental Position-Angle.	Correction for Index-Error and Equatorial Adjustment.	Refraction.	Precession, Proper Motion, and Aberration.	Corrected Position-Angle, Equinox 1889.	Definition I. S.	Correction.
		1890	h m	° ′ ″	′ ″	″	″	° ′ ″		″
1125	G	Oct. 13	21 30·3	332 24 28	− 36 30	− 5·0	+ 28·3	331 48 21	3–4 : 3–4	+ 10
1135	G	„ 15	20 56·0	24 52	− 36 34	+ 0·3	+ 28·3	48 47	3–4 : 3–4	+ 2
1145	G	„ 17	21 4·0	24 57	− 36 33	− 0·7	+ 28·3	48 52	2–3 : 3	+ 2
1183	G	„ 22	21 48·6	24 35	− 36 26	− 8·8	+ 28·3	48 29	3 : 3	+ 6
1206	F	Oct. 24	22 49·1	332 25 2	− 36 16	− 32·9	+ 28·3	48 41	1–2 : 2	− 4
1232	F	Nov. 3	22 18·2	24 43	− 36 21	− 17·7	+ 28·5	48 33	3 : 3	− 11
1241	F	„ 4	22 16·4	24 22	− 36 21	− 17·0	+ 28·5	48 12	3 : 3	− 14
1249	F	„ 6	22 30·5	24 52	− 36 19	− 22·7	+ 28·5	48 39	2–3 : 2–3	− 3

Pair 176. f and g. $\mu_p = +3''\cdot44$

81	G	1889 Sept. 11	23 14·0	34 32 21	− 36 12	− 1·6	+ 7·4	33 56 15	3 : 3	+ 5

Pair 178. β_1 and β_2.

4	G	1889 Sept. 1	18 46·9	271 23 15	− 35 39	− 10·6	+ 6·9	270 47 21	...	+ 14
5	G	„ 1	18 55·0	23 45	− 35 39	− 9·1	+ 6·9	47 53	...	+ 14

Pair 179.

21	G	1889 Sept. 3	22 25·9	234 21 6	− 36 25	+ 14·3	+ 7·7	233 45 3	...	0
31	G	„ 6	18 28·9	20 7	− 35 39	− 10·6	+ 7·7	44 25	...	+ 10

Pair 180.

47	G	1889 Sept. 8	18 8·2	271 48 15	− 35 40	− 20·2	+ 7·6	271 12 22	...	+ 8

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The first step in the discussion of these position-angles was to compare the position-angles measured by Gill and Finlay.

For this purpose it was assumed—

1st. That the observations of both observers have equal weight.

2nd. That the zero of position-angle is determined by both observers with an accuracy proportionate to the distance between the stars under observation; in other words that the weight of each observation in determining the systematic error $G_p - F_p$ is proportional to the square of the distance.

If we take 1000″ as the unit of distance, and if s_1 is the distance expressed in this unit, and n_g and n_f are the number of observations by Gill and Finlay respectively (two observations of half weight being reckoned as one); then, for each pair of stars measured in position-angle by both observers, the weight of $G_p - F_p$ will be

$$p = \frac{n_g \times n_f}{n_g + n_f} \times s_1^2$$

The means of the observations of Table XIII. corrected for instantaneous index-error give—

Pair.	$G_p - F_p$.	No. of Obs. G.	No. of Obs. F.	s_1.	p.	$p\,(G_p - F_p)$
14	0″·0	2	2	6·0	36·0	0″·0
15	+ 32·0	2	2	3·4	11·6	+ 371·2
60	+ 3·5	3½	4	6·9	90·4	+ 316·4
65	+ 15·5	2	2	4·5	20·2	+ 313·1
66	— 6·0	7	2	6·9	76·2	— 457·2
67	+ 4·5	3	2	5·6	37·7	+ 169·6
70	+ 13·0	6	2	4·4	29·1	+ 378·3
71	+ 2·0	3½	4	4·2	33·4	+ 66·8
81	— 3·0	3	1	4·5	14·2	— 42·6
85	+ 15·0	4	4	4·9	48·0	+ 720·0
105	+ 11·5	3	2	6·8	55·4	+ 637·1
161	+ 8·0	4	4	5·0	50·0	+ 400·0
170	+ 10·0	4	3	5·0	42·5	+ 425·0
				Sum =	544·7	+ 3297·7

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Whence $G_p - F_p = \frac{3297''\cdot7}{544\cdot7} = +\ 6''\cdot05$, and $\frac{[p\,v\,v]}{n-1} = \epsilon^2 = 2689$, and $\epsilon = \pm\ 51''\cdot9$

That is to say, for a distance of 1000″ the *mean error* of an observation of position-angle is ± 51″·9, corresponding to ± 0″·25 on a great circle; and the mean error of $G_p - F_p$ is

$$= \sqrt{\frac{2689}{544\cdot7}} = \pm\ 2''\cdot2.$$

Applying the correction $G_p - F_p = +\ 6''\cdot0$ to Finlay's results we obtain:—

TABLE XIV.

Pair 14. θ and κ.				v
		1890	° ′ ″	″
1148	G	Oct. 17	345 32 34	−0·17
1177	G	„ 19	32 40	0·00
1207	F	„ 24	32 41	+0·03
1254	F	Nov. 6	32 45	+0·14
			345 32 40·0	

Pair 15. λ and θ.				v
		1890		
1152	G	Oct. 17	297 57 19	+0·27
1178	G	„ 19	57 12	+0·16
1208	F	„ 24	56 53	−0·16
1251	F	Nov. 6	56 46	−0·27
			297 57 2·5	

Pair 16. λ and κ.				v
		1889		
49	G	Sept. 8	20 0 35	+0·06
		1890		
1156	G	Oct. 17	0 29	−0·06
			20 0 32	

Pair 31. ζ and a.				
		1889	° ′ ″	
19	G	Sept. 3	138 49 55	...

Pair 53. f and a.				
		1889		
37	G	Sept. 6	238 35 39	...

Pair 60. d and m.					v
		1890			″
1224	G	Oct. 13		238 26 31	+0·05
1136	G	„ 15	(½)	26 21	−0·28
1146	G	„ 17		26 27	−0·08
1173	G	„ 19		26 30	+0·02
1201	F	„ 24		26 35	+0·19
1235	F	Nov. 3		26 27	−0·08
1242	F	„ 4		26 14	−0·52
1250	F	„ 6		26 46	+0·56
				238 26 29·4	

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TABLE XIV.—*continued.*

Pair 65. θ and ζ.

				v
		1890	° ′ ″	″
1151	G	Oct. 17	27 27 55	+0·22
1179	G	„ 19	27 44	−0·02
1212	F	„ 24	27 43	−0·04
1247	F	Nov. 4	27 37	−0·17
			27 27 44·8	

Pair 66. λ and μ.

				v
		1889		
23	G	Sept. 3	342 6 9	−0·34
		1890		
384	G	June 19	6 16	−0·11
392	G	„ 23	6 22	+0·04
402	G	„ 28	6 36	+0·56
1153	G	Oct. 17	6 0	−0·64
1216	G	„ 25	6 24	+0·16
1227	G	„ 30	6 9	−0·34
375	F	June 18	6 33	+0·46
395	F	„ 24	6 24	+0·16
			342 6 19·2	

Pair 67. λ and ζ.

				v
		1889		
55	G	Sept. 8	64 50 8	−0·15
		1890		
1155	G	Oct. 17	50 19	+0·15
1185	G	„ 22	50 12	−0·04
1209	F	„ 24	50 16	+0·07
1233	F	Nov. 3	50 13	−0·02
			64 50 13·6	

Pair 70. μ and κ.

				v
		1889	° ′ ″	″
12	G	Sept. 3	303 35 13	+0·27
29	G	„ 6	35 22	+0·46
		1890		
385	G	June 19	34 52	−0·17
391	G	„ 23	35 3	+0·06
401	G	„ 28	34 58	−0·04
1225	G	Oct. 30	34 43	−0·36
376	F	June 18	34 52	−0·17
397	F	„ 24	34 58	−0·04
			303 35 0·1	

Pair 71. z and α.

					v
		1890			
1123	G	Oct. 13		357 1 16	−0·06
1139	G	„ 15	(½ wt.)	1 4	(½ wt.)−0·30
1150	G	„ 17		1 14	−0·10
1215	G	„ 25		1 26	+0·15
1204	F	„ 24		1 25	+0·13
1244	F	Nov. 4		0 48	−0·63
1252	F	„ 6		1 36	+0·35
1258	F	„ 7		1 33	+0·29
				357 1 18·7	

Pair 81. ε and ι.

				v
		1890		
386	G	June 19	63 6 22	−0·33
390	G	„ 23	6 44	+0·15
400	G	„ 28	6 39	+0·04
396	F	„ 24	6 44	+0·15
			63 6 37·3	

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TABLE XIV.—*continued.*

Pair 85. E and m. v

		1890	° ′ ″	″
1137	G	Oct. 15	(½ wt.) 194 45 50	—0·18
1147	G	„ 17	46 2	+0·11
1172	G	„ 19	46 17	+0·46
1184	G	„ 22	45 54	—0·08
1202	F	„ 24	46 9	+0·27
1237	F	Nov. 3	45 58	+0·01
1243	F	„ 4	45 27	—0·73
1257	F	„ 7	45 59	+0·04
			194 45 57·5	

Pair 95. f and m.

		1889		
77	G	Sept. 11	265 9 4	...

Pair 96. f and l.

		1889		
41	G	Sept. 6	34 55 59	...

Pair 100. q and m.

		1889		
67	G	Sept. 10	86 47 6	...

Pair 105. λ and δ. v

		1889		
73	G	Sept. 11	290 35 56	+0·24
		1890		
1174	G	Oct. 19	35 59	+0·34
1230	G	„ 30	35 38	—0·36
1211	F	„ 24	35 47	—0·06
1234	F	Nov. 3	35 44	—0·16
			290 35 48·8	

Pair 116. E and i.

		1890	° ′ ″	
1126	G	Oct. 13	182 11 41	...

Pair 122. f and e.

		1889		
69	G	Sept. 10	235 34 8	...

Pair 124. q and w. v

		1889		″
61	G	Sept. 10	271 59 7	+0·05
65	G	„ 10	59 4	—0·05
			271 59 5·5	

Pair 138. f and b.

		1889		
75	G	Sept. 11	220 3 50	...

Pair 161. ε and δ. v

		1890		
1171	G	Oct. 19	186 28 33	—0·32
1176	G	„ 19	28 42	—0·10
1182	G	„ 22	28 55	+0·22
1214	G	„ 25	28 57	+0·27
1203	F	„ 24	28 43	—0·07
1238	F	Nov. 3	28 41	—0·12
1246	F	„ 4	28 54	+0·19
1256	F	„ 7	28 43	—0·07
			186 28 46·0	

Pair 164. f and k.

		1889		
57	G	Sept. 8	60 12 17	...

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TABLE XIV.—*concluded.*

Pair 170. E and f.				v
		1890	° ′ ″	″
1125	G	Oct. 13	151 48 31	−0·23
1135	G	„ 15	48 49	+0·21
1145	G	„ 17	48 54	+0·33
1183	G	„ 22	48 35	−0·13
1206	F	„ 24	48 43	+0·07
1232	F	Nov. 3	48 28	−0·30
1241	F	„ 4	rejected [4]	
1249	F	„ 6	48 42	+0·04
			151 48 40·3	

Pair 176. f and g.				
		1889	° ′ ″	
81	G	Sept. 11	33 56 20	...

Pair 178. β_1 and β_2.				
		1889		...
4	G	Sept. 1	270 47 35	
5	G	„ 1	48 7	...
			270 47 52	

In the preceding results the column v gives the equivalent of the deviation of each result from the mean in seconds of arc on the great circle. From these values of v we may deduce independently the mean error of an observation of position-angle as follows, by the formula

$$\varepsilon^2 = \frac{[vv]}{n-1}$$

the weight of each value of ε^2 so deduced being $n-1$.

From distances $< 5000''$. From distances $> 5000''$.

Pair.	ε^2	n—1	ε^2 (n—1)	Pair.	ε^2	n—1	ε^2 (n—1)
15	·0657	3	·1971	14	·0165	3	·0495
16	·0072	1	·0072	60	·1020	7	·7140
65	·0264	3	·0792	66	·1547	8	1·2376
70	·0684	7	·4788	67	·0130	4	·0520
71	·1002	7	·7014	105	·0830	4	·3320
81	·0518	3	·1554	124	·0050	1	·0050
85	·1220	7	·8540	161	·0420	7	·2940
				170	·0532	6	·3192
		31	2·4731			40	3·0033

Whence $\varepsilon^2 =$ ·0798 $\varepsilon^2 =$ ·0751

$\varepsilon = \pm 0''\cdot282$ $\varepsilon = \pm 0''\cdot274$

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and we may conclude that, equally for long and short distances, the mean error of a Heliometer observation of position-angle is

$$\pm\ 0''\cdot28 \text{ on the great circle ;}$$

which is in sufficiently satisfactory agreement with that derived from the comparison Gill—Finlay (viz $\pm\ 0''\cdot25$) by an independent method.

The next step is to deduce the absolute correction applicable to the assumed position-angle of the Standard stars, and therefore also to all the position-angles of Table XIV.

For this purpose 21 pairs of stars are available which have been observed both with the Heliometer and with Meridian instruments. The pairs 85, 116 and 170 are not available, because the auxiliary star E has not been observed at 22 meridian observatories like the other stars, and its place, so far, depends only on four meridian observations at the Cape.

In the following Table—

Column 1 gives the reference number of the pair.

„ 2 „ the distance expressed in terms of s_1.

„ 3 „ the seconds of the position-angle at the middle point between the stars, rigorously computed from the data of Table V. (by the formulæ given Chap. V. p. 118).

„ 4 „ the correction applicable to the position-angles on account of errors in the Right Ascensions due to difference of magnitude, computed from the data of Chapter VI. p. 143.

„ 5 „ the corrected seconds of the tabular position-angles.

„ 6 „ the seconds of the observed position-angles from Table XIV.

„ 7 „ the excess of the tabular (or computed) position-angles over the observed position-angles ... ... = (C − O).

„ 8 „ the number of observations ... ... = n.

„ 9 „ the weight of the Tabular position-angle = p_c.

„ 10 „ „ Observed „ = $p_o \times n$

„ 11 „ „ (C − O) ... ... = p.

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The weights of columns 9 and 10 have been computed as follows—

The *mean error* of a position-angle computed from the data of Table V. is $\pm\ 0''\cdot125$ on the great circle, or in position-angle $= \pm \frac{25''\cdot8}{s_1}$.

The *mean error* of a single observation of position-angle we have found to be $\pm\ 0''\cdot28$ on the great circle, or in position-angle $= \pm \frac{51''\cdot9}{s_1}$.

Since relative and not absolute weights are required we may conveniently adopt

$\left(\frac{s_1}{2\cdot58}\right)^2$ for the weight of a single tabular position-angle $= \cdot150 s_1^2 = p_c$

and

$\left(\frac{s_1}{5\cdot19}\right)^2$ for the weight of a single observed position-angle $= \cdot0371 s_1^2 = p_o$

The weight of C − O is then $\frac{p_c \times np_o}{p_c + np_o}$ ... ... $= p$

	s_1.	C.	Correction for Magnitude.	C. corrected.	O.	C — O.	n.	p_c.	np_o.	p.
		″	″	″	″	″				
14	5·95	54·6	+ 1·1	55·7	40·0	+ 15·7	4	5·4	5·4	2·70
15	3·40	10·5	+ 0·3	10·8	2·5	+ 8·3	4	1·7	1·7	0·85
16	4·43	29·7	+ 0·9	30·6	32·0	− 1·4	2	2·9	1·5	0·99
31	6·48	28·7	0·0	88·7	55·0	+ 33·7	1	6·3	1·6	1·28
53	6·74	52·6	− 0·3	52·3	39·0	+ 13·3	1	6·8	1·7	1·36
60	6·94	33·5	− 2·5	31·0	29·4	+ 1·6	7½	7·1	13·3	4·63
65	4·48	8·1	+ 0·3	68·4	44·8	+ 23·6	4	3·0	3·0	1·50
66	6·91	22·5	+ 0·5	23·0	19·2	+ 3·8	9	7·1	15·9	4·91
67	5·60	18·2	+ 0·1	18·3	13·6	+ 4·7	5	4·7	5·8	2·60
70	4·36	1·4	+ 0·9	2·3	0·1	+ 2·2	8	2·9	5·8	1·93
71	4·20	31·6	+ 0·9	32·5	18·7	+ 13·8	7½	2·6	4·9	1·70
81	4·48	33·8	+ 0·3	34·1	37·3	− 3·2	4	3·0	3·0	1·50
95	3·65	50·8	− 0·2	50·6	64·0	− 13·4	1	2·0	0·5	0·40
96	5·53	28·4	+ 0·5	88·9	59·0	+ 29·9	1	4·6	1·1	0·89
100	6·73	0·5	+ 0·2	0·7	6·0	− 5·3	1	6·8	1·7	1·36
105	6·78	55·3	+ 0·2	55·5	48·8	+ 6·7	5	6·9	8·6	3·83
122	2·36	10·6	− 0·5	10·1	8·0	+ 2·1	1	0·8	0·2	0·16
124	7·23	52·2	+ 0·8	53·0	65·5	− 12·5	2	7·8	3·9	2·60
138	6·68	41·4	− 0·6	40·8	50·0	− 9·2	1	6·7	1·7	1·36
161	5·01	49·7	− 2·5	47·2	46·0	+ 1·2	8	3·8	7·5	2·51
164	3·15	3·1	+ 0·5	3·6	17·0	− 13·4	1	1·5	0·4	0·32

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The resulting mean value of (C − O), having regard to the weights of column p, is

$$+ 5''\cdot1 \text{ with a } \textit{mean error} \text{ of } \pm 2''\cdot4,$$

and this correction must be applied to all the results of Table XIV. This having been done, we obtain the definitive values of the observed position-angles which are given in Table XV.

The weights of these observations will be most conveniently derived by computing the squares of their mean errors on the great circle.

The sources of error which affect them are

a. The accidental error of a single observation was found to be ± 0″·28 on the great circle, whence for any result depending on n observations we have

$$\epsilon_a^2 = \frac{(0''\cdot28)^2}{n} = \frac{\cdot0784}{n}$$

b. Error due to uncertainty of the absolute position-angle of the Standard stars.

The mean error of this determination has been just found to be

$$\pm 2''\cdot4 \text{ in position-angle} = \pm 0''\cdot0116 s_1$$

whence $\epsilon_b^2 = (\pm 0''\cdot0116 s_1)^2 = \cdot000134 s_1^2$.

c. Error due to uncertainty in the correction for proper motion. The square of the mean error of the determination of the proper motion either for distance or position-angle (on the great circle) may be obtained at sight from Table V. by adding the squares of the mean errors of the proper motion given for the two stars in column 16 of that Table. Putting this sum $= \epsilon_c^2$.

The complete expression for the mean error of each observed position-angle becomes

$$\epsilon^2 = \frac{\cdot0784}{n} + \cdot000134 s_1^2 + \epsilon_c^2$$

and the weight computed on the same system as the weights of the distances (viz., weight *unity* for an estimated mean error of ± 0″·20), is

$$\text{weight} = \frac{0\cdot04}{\epsilon^2}$$

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The results of all the observations of position-angle are finally embraced in the following Table XV.

TABLE XV.

Comparison of Observed and Tabular Position Angles.

Rotation No.	Stars.	Tabular Position-Angle.	Observed Position-Angle.	O — C.	On Great Circle.	Weight.
		° ′ ″	° ′ ″	″	″	
14	θ κ	345 32 54·6	345 32 45·1	— 9·5	— 0·27	1·6
15	λ θ	297 57 10·5	297 57 7·6	— 2·9	— 0·05	1·9
16	λ κ	20 0 29·7	20 0 37·1	+ 7·4	+ 0·16	0·9
31	ζ α	138 50 28·7	138 50 0·1	— 28·6	[— 0·90] Rejected	0·4
53	f a	238 35 52·6	238 35 44·1	— 8·5	— 0·28	0·4
60	d m	238 26 33·5	238 26 34·5	+ 1·0	+ 0·03	2·3
65	θ ζ	27 28 8·1	27 27 49·9	— 18·2	— 0·39	1·6
66	λ μ	342 6 22·5	342 6 24·3	+ 1·8	+ 0·06	2·5
67	λ ζ	64 50 18·2	64 50 18·7	+ 0·5	+ 0·01	2·2
70	μ κ	303 35 1·4	303 35 5·2	+ 3·8	+ 0·08	3·1
71	z α	357 1 31·6	357 1 23·8	— 7·8	— 0·16	2·4
81	ε ι	63 6 33·8	63 6 42·4	+ 8·6	+ 0·17	1·7
85	E m	194 46 11·0	194 46 2·6	— 8·4	— 0·20	2·9
95	f m	265 8 50·8	265 9 9·1	+ 18·3	+ 0·32	0·5
96	f l	34 56 28·4	34 56 4·1	— 24·3	— 0·65	0·4
100	q m	86 47 0·5	86 47 11·1	+ 10·6	+ 0·35	0·5
105	λ δ	290 35 55·3	290 35 53·9	— 1·4	— 0·04	1·7
116	E i	182 11 56·4	182 11 46·1	— 10·3	— 0·21	0·4
122	f e	235 34 10·6	235 34 13·1	+ 2·5	+ 0·03	0·5
124	q w	271 58 52·2	271 59 10·5	+ 18·3	+ 0·64	0·8
138	f b	220 3 41·4	220 3 55·1	+ 13·7	+ 0·44	0·4
161	ε δ	186 28 49·7	186 28 51·1	+ 1·4	+ 0·04	2·8
164	f k	60 12 3·1	60 12 22·1	+ 19·0	+ 0·29	0·5
170	E f	151 48 59·8	151 48 45·4	— 14·4	— 0·36	2·7
176	f g	33 57 34·3	33 56 25·1	— 69·2	+ 0·42	0·5
123		Standard Stars.		+ 5·1	+ 0·15	8·0

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CHAPTER IX.

Formation and Solution of the Equations of Condition.

Having now obtained definitive values and weights for the results of the meridian observations and for the Heliometer observations of distance and position-angle, it remains to combine the whole in such a way as to derive the most probable co-ordinates of the 37 comparison stars and the two auxiliary stars.

It was not my original intention to strictly satisfy the condition that the sums of the squares of the residuals multiplied by their respective weights should be a minimum, as this involves the formation of normal equations for 78 unknown quantities, and the subsequent elimination of the 78 unknown quantities from the normal equations. The original plan may be most simply illustrated by taking a particular case.

Taking the case of the auxiliary star E and the surrounding stars from which measures of distance or position-angle were obtained.

If we put—

$$x_E = \Delta\alpha_E \cos\delta$$
$$y_E = \Delta\delta_E$$

where $\Delta\alpha_E$ and $\Delta\delta_E$ are the true corrections to the assumed Right Ascension and Declination of E, and if, for the moment, we suppose that the places of the surrounding stars are determined without error, and that p_E is the position-angle of the star E with respect to any of the surrounding stars (the unnamed star being taken as origin) then each observation of distance compared with the computed distance gives an equation of the form—

$\sin p_E x_E + \cos p_E y_E = O - C$ [the value of which is taken from Table X., Chap. VII.]

and the position-angles give equations of the form—

$\cos p_E x_E - \sin p_E y_E = O - C$ [the value of which is given in Table XV., Chap. VIII.].

If there were accurate meridian observations of E (which there are not), the transit-circle observation of Right Ascensions would give an equation of the form—

$$x_E = M$$

where M is the systematic correction for magnitude (Chap. VI., p. 143), and the Declinations give equations of the form—

$$y_E = 0.$$

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The actual equations thus formed are the following :—

To determine E.

Pair.		Distances.	Weight.	v_1	v
i E	116	$-\ \cdot04\,x_E - 1\cdot00\,y_E = -\ 0''\cdot50$	2·2	$+0''\cdot05$	$+\ \cdot02$
k E	150	$-\ \cdot06 - 1\cdot00 - \cdot54$	1·8	$+\ \cdot02$	$-\ \cdot03$
m E	85	$-\ \cdot25 - \cdot97 - \cdot60$	6·0	$-\ \cdot02$	$\cdot00$
n E	36	$-\ \cdot89 - \cdot46 - \cdot49$	5·4	$-\ \cdot08$	$+\ \cdot04$
b E	35	$+\ 1\cdot00 + \cdot10 + \cdot31$	2·7	$+\ \cdot08$	$+\ \cdot04$
d E	10	$+\ \cdot97 - \cdot23 - \cdot09$	5·4	$-\ \cdot05$	$-\ \cdot04$
c E	86	$+\ \cdot83 - \cdot56 - \cdot26$	2·4	$-\ \cdot10$	$-\ \cdot09$
e E	8	$+\ \cdot81 - \cdot58 - \cdot18$	5·4	$\cdot00$	$-\ \cdot01$
f E	170	$+\ \cdot47 - \cdot88 - \cdot54$	5·2	$-\ \cdot14$	$-\ \cdot12$
g E	162	$+\ \cdot29 - \cdot96 - \cdot23$	2·1	$+\ \cdot25$	$+\ \cdot15$
h E	135	$+\ \cdot17 - \cdot99 - \cdot19$	1·4	$+\ \cdot32$	$+\ \cdot27$
		Position-Angles.			
i E	116p	$-\ 1\cdot00\,x_E + \cdot04\,y_E = -\ \cdot21$	0·4	$-\ \cdot06$	$-\ \cdot07$
m E	85p	$-\ \cdot97 + \cdot25 - \cdot20$	2·9	$-\ \cdot17$	$-\ \cdot13$
f E	170p	$-\ \cdot88 - \cdot47 - \cdot36$	2·7	$+\ \cdot05$	$-\ \cdot09$

The resulting normal equations, having regard to the weights, are—

$$24\cdot11x_E - 3\cdot28y_E = +\ 2\cdot41$$
$$-\ 3\cdot28 + 21\cdot81 = +\ 11\cdot41$$

whence—

$$x_E = +\ 0''\cdot1745 \text{ weight } 23\cdot62$$
$$y_E = +\ 0''\cdot5494 \quad ,, \quad 21\cdot36$$

and these are rigorously the most probable values and the true weights of x_E and y_E, provided that the tabular places of the stars i, k, m, n, &c., are without error.

The substitution of these values of x_E and y_E in the original equations gives the residuals v_1.

It is obvious from the smallness of these residuals, as well as from the large number of meridian observations with which the star E is now connected, that we have obtained very approximately true values of x_E and y_E ; and that, similarly, we may obtain very approximate values of x_F and y_F for the other auxiliary star.

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My original plan was then :—

1. Having found, as above, very approximate values of x_E, y_E, x_F, and y_F, to substitute them in all the equations in which the terms occur.

2. Discuss precisely in the same way all the measures made from stars surrounding star a, and find approximate values of x_a and y_a. Similarly, find approximate values of x_b and y_b, of x_c and y_c, and so on for all the stars of the triangulation.

3. Finally, substitute the values of x_a and y_a, x_b and y_b, &c. (found by the first approximation) in the original equations, and make a second solution, which might be regarded as final.

Unquestionably very approximate results could be readily reached in this way, but a little consideration showed that the method is capable not only of considerable simplification and extension, but also of rigorously satisfying the conditions of the method of least squares.

Suppose that the star X has been measured in distance or position-angle from the stars A, B, C, the complete equations resulting from comparison with the corresponding tabular values will be :—

Pair—

$$\begin{aligned} \text{A X} \quad &\ldots \quad a_1x_X + b_1y_X = n_1 + a_1x_A + b_1y_A \\ \text{B X} \quad &\ldots \quad a_2x_X + b_2y_X = n_2 + a_2x_B + b_2y_B \\ \text{C X} \quad &\ldots \quad a_3x_X + b_3y_X = n_3 + a_3x_C + b_3y_C \end{aligned}$$

To form the normals in x_X we have—

$$\begin{aligned} a_1a_1x_X + a_1b_1y_X &= a_1n_1 + a_1a_1x_A + a_1b_1y_A \\ a_2a_2x_X + a_2b_2y_X &= a_2n_2 + a_2a_2x_B + a_2b_2y_B \\ a_3a_3x_X + a_3b_3y_X &= a_3n_3 + a_3a_3x_C + a_3b_3y_C \end{aligned}$$

and to form the normals in y_X—

$$\begin{aligned} a_1b_1x_X + b_1b_1y_X &= b_1n_1 + a_1b_1x_A + b_1b_1y_A \\ a_2b_2x_X + b_2b_2y_X &= b_2n_2 + a_2b_2x_B + b_2b_2y_B \\ a_3b_3x_X + b_3b_3y_X &= b_3n_3 + a_3b_3x_C + b_3b_3y_C \end{aligned}$$

and the sums of these, which are the resulting normals, may be written, in the usual notation of the method of least squares, in the form.

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Normal in x_X—

$$[a\,a]\,x_X + [a\,b]\,y_X = [a\,n] + \text{correction } I_X.$$

Normal in y_X—

$$[a\,b]\,x_X + [b\,b]\,y_X = [b\,n] + \text{correction } II_X.$$

Where—

Correction I_X is	Correction II_X is
$+ a_1a_1x_A + a_1b_1y_A$	$+ a_1b_1x_A + b_1b_1y_A$
$+ a_2a_2x_B + a_2b_2y_B$	$+ a_2b_2x_B + b_2b_2y_B$
$+ a_3a_3x_C + a_3b_3y_C$	$+ a_3b_3x_C + b_3b_3y_C$

But the co-efficients of x_A, y_A, x_B, y_B, &c. in these corrections are precisely the same as the co-efficients of x_X and y_X which we have to compute in forming normal equations; hence it is unnecessary to consider the terms in x_A, y_A, x_B, y_B, &c., on the right hand side of the equation in forming the normals, it is sufficient to write them out as above.

The normal equations thus formed, since they comprehend all the equations in which x_X and y_X occur in the triangulation, are the true normals in x_X and y_X.

Taking the preceding example—Star E—the complete normals and their solution are—

Normal Equations.	*Solution.*	p'
$24{\cdot}11x_E - 3{\cdot}28y_E = + 2''{\cdot}41 + I_E$	$x_E = + 0''{\cdot}1745 + III_E$	(23·62)
$- 3{\cdot}28 + 21{\cdot}81 = + 11{\cdot}41 + II_E$	$y_E = + 0{\cdot}5494 + IV_E$	(21·36)

I_E	II_E	III_E	IV_E
$+ 0{\cdot}41x_i + 0{\cdot}07y_i$	$+ 0{\cdot}07x_i + 2{\cdot}19y_i$	$+ {\cdot}018x_i + {\cdot}017y_i$	$+ {\cdot}006x_i + {\cdot}103y_i$
$+ 0{\cdot}01x_k + 0{\cdot}11y_k$	$+ 0{\cdot}11x_k + 1{\cdot}80y_k$	$+ {\cdot}001x_k + {\cdot}016y_k$	$+ {\cdot}005x_k + {\cdot}085y_k$
$+ 3{\cdot}09x_m + 0{\cdot}74y_m$	$+ 0{\cdot}74x_m + 5{\cdot}84y_m$	$+ {\cdot}132x_m + {\cdot}068y_m$	$+ {\cdot}054x_m + {\cdot}278y_m$
$+ 4{\cdot}24x_n + 2{\cdot}20y_n$	$+ 2{\cdot}20x_n + 1{\cdot}14y_n$	$+ {\cdot}193x_n + {\cdot}100y_n$	$+ {\cdot}130x_n + {\cdot}067y_n$
$+ 2{\cdot}69x_b + 0{\cdot}26y_b$	$+ 0{\cdot}26x_b + 0{\cdot}03y_b$	$+ {\cdot}115x_b + {\cdot}011y_b$	$+ {\cdot}029x_b + {\cdot}003y_b$
$+ 5{\cdot}06x_d - 1{\cdot}19y_d$	$- 1{\cdot}19x_d + 0{\cdot}28y_d$	$+ {\cdot}207x_d - {\cdot}049y_d$	$- {\cdot}024x_d + {\cdot}005y_d$
$+ 1{\cdot}59x_c - 1{\cdot}07y_c$	$- 1{\cdot}07x_c + 0{\cdot}72y_c$	$+ {\cdot}061x_c - {\cdot}041y_c$	$- {\cdot}040x_c + {\cdot}027y_c$
$+ 3{\cdot}53x_e - 2{\cdot}54y_e$	$- 2{\cdot}54x_e + 1{\cdot}82y_e$	$+ {\cdot}133x_e - {\cdot}096y_e$	$- {\cdot}096x_e + {\cdot}069y_e$
$+ 3{\cdot}27x_f - 1{\cdot}05y_f$	$- 1{\cdot}05x_f + 4{\cdot}69y_f$	$+ {\cdot}132x_f - {\cdot}015y_f$	$- {\cdot}028x_f + {\cdot}213y_f$
$+ 0{\cdot}18x_g - 0{\cdot}58y_g$	$- 0{\cdot}58x_g + 1{\cdot}93y_g$	$- {\cdot}004x_g - {\cdot}012y_g$	$- {\cdot}026x_g + {\cdot}087y_g$
$+ 0{\cdot}04x_h - 0{\cdot}23y_h$	$- 0{\cdot}23x_h + 1{\cdot}37y_h$	${\cdot}000x_h - {\cdot}002y_h$	$- {\cdot}011x_h + {\cdot}063y_h$

The quantities marked p' and included in brackets would be the true weghts of x_E and y_E respectively, if the terms III_E and IV_E did not exist.

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Similarly for the other auxiliary star, F, the equations are—

Pair.		From the Distances.	Weight.	v_1	v
		"		"	"
xF	117	$- \cdot 24x_F - \cdot 97y_F = - 0 \cdot 45$	3·9	− ·11	−0·09
yF	151	− ·60 − ·80 − ·72	2·1	− ·41	− ·33
zF	87	− ·82 − ·57 − ·08	3·2	+ ·15	+ ·13
aF	38	− ·96 + ·28 + ·17	7·2	+ ·13	+ ·05
sF	37	+ ·87 − ·49 − ·07	6·6	+ ·05	− ·01
tF	12	+ ·58 − ·81 − ·26	3·3	− ·02	·00
uF	163	+ ·53 − ·85 − ·11	2·8	+ ·15	+ ·10
vF	88	+ ·43 − ·90 − ·12	3·9	+ ·16	+ ·14
wF	136	·00 − 1·00 − ·32	3·9	+ ·02	+ ·04

Normal Equations.	*Solution.*	p'
$17 \cdot 39x_F - 5 \cdot 66y_F = - 0 \cdot 91 + \mathrm{I}_F$	$x_F = + 0'' \cdot 0580 + \mathrm{III}_F$	(15·74)
$- 5 \cdot 66 + 19 \cdot 38 = + 6 \cdot 24 + \mathrm{II}_F$	$y_F = + 0 \cdot 3389 + \mathrm{IV}_F$	(17·54)

I_F	II_F	III_F	IV_F
$+ \cdot 22x_x + \cdot 90y_x$	$+ \cdot 90x_x + 3 \cdot 65y_x$	$+ \cdot 031x_x + \cdot 125y_x$	$+ \cdot 055x_x + \cdot 225y_x$
$+ \cdot 76x_y + 1 \cdot 01y_y$	$+ 1 \cdot 01x_y + 1 \cdot 35y_y$	$+ \cdot 067x_y + \cdot 089y_y$	$+ \cdot 072x_y + \cdot 096y_y$
$+ 2 \cdot 16x_z + 1 \cdot 50y_z$	$+ 1 \cdot 50x_z + 1 \cdot 04y_z$	$+ \cdot 165x_z + \cdot 115y_z$	$+ \cdot 126x_z + \cdot 087y_z$
$+ 6 \cdot 60x_a - 1 \cdot 93y_a$	$- 1 \cdot 93x_a + \cdot 56y_a$	$+ \cdot 384x_a - \cdot 112y_a$	$+ \cdot 012x_a - \cdot 004y_a$
$+ 5 \cdot 02x_s - 2 \cdot 82y_s$	$- 2 \cdot 82x_s + 1 \cdot 59y_s$	$+ \cdot 267x_s - \cdot 150y_s$	$- \cdot 068x_s + \cdot 038y_s$
$+ 1 \cdot 12x_t - 1 \cdot 56y_t$	$- 1 \cdot 56x_t + 2 \cdot 16y_t$	$+ \cdot 042x_t - \cdot 059y_t$	$- \cdot 068x_t + \cdot 094y_t$
$+ \cdot 79x_u - 1 \cdot 26y_u$	$- 1 \cdot 26x_u + 2 \cdot 02y_u$	$+ \cdot 027x_u - \cdot 042y_u$	$- \cdot 057x_u + \cdot 092y_u$
$+ \cdot 72x_v - 1 \cdot 50y_v$	$+ 1 \cdot 50x_v + 3 \cdot 13y_v$	$+ \cdot 018x_v - \cdot 037y_v$	$- \cdot 072x_v + \cdot 151y_v$
$\cdot 00x_w \quad \cdot 00y_w$	$\cdot 00x_w + 3 \cdot 88y_u$	$\cdot 000x_w + \cdot 072y_w$	$\cdot 000x_w + \cdot 221y_w$

If similar operations be performed for the equations which result from each star in the triangulation, we obtain at once approximate values of x_a and y_a, x_b and y_b, &c., and expressions for the corrections III_a and IV_a, III_b and IV_b, &c.

The definitive solution therefore resolves itself into determining, by successive approximations, values of the corrections III_a and IV_a, III_b and IV_b, &c., and the proof that we have arrived at definitive values is found by substituting the final values of x_a, y_a, x_b, y_b, &c., in the original normals and in their corrections I_a, II_a, I_b, II_b, &c., when, if the solution is definitive, the equations are satisfied.

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The process of successive approximation is very simple and methodical; it may be more conveniently described after presentation of the equations. These are as follows:—

To determine Star a. *Mag.* 7·8.

Pair.		Distances.	Weight.	v
		″		″
ca	93	$-\ \cdot 64x_a - \cdot 77y_a = -\ \cdot 09$	5·3	$-\ \cdot 11$
fa	53	$-\ \cdot 85 - \cdot 52 \quad \cdot 00$	3·2	$-\ \cdot 04$
ea	59	$-\ \cdot 87 - \cdot 50 + \cdot 04$	2·8	$+\ \cdot 11$
da	9	$-\ 1\cdot 00 - \cdot 05 + \cdot 07$	6·3	$+\ \cdot 05$
ba	51	$-\ \cdot 67 + \cdot 74 - \cdot 25$	7·7	$-\ \cdot 08$
		Position-Angles.		
fa	53p	$-\ \cdot 52x_a + \cdot 85y_a = -\ \cdot 28$	0·4	$-\ \cdot 27$
		Meridian Observations.		
		$1\cdot 00x_a + \cdot 00y_a = -\ \cdot 01$	4·5	$-\ \cdot 09$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	11·0	$+\ \cdot 02$

Normal Equations.	*Solution.*	p'
$+\ 20\cdot 93x_a + 1\cdot 57y_a = +\ 1\cdot 06 + \mathrm{I}_a$	$x_a = +\ 0''\cdot 0555 + \mathrm{III}_a$	(20·81)
$+\ 1\cdot 57 + 20\cdot 23 = -\ 1\cdot 22 + \mathrm{II}_a$	$y_a = -\ 0\cdot 0646 + \mathrm{IV}_a$	(20·11)

	I_a	II_a	III_a	IV_a
c	$+\ 2\cdot 16x + 2\cdot 60y$	$+\ 2\cdot 60x + 3\cdot 13y$	$+\ \cdot 094x + \cdot 113y$	$+\ \cdot 121x + \cdot 146y$
f	$+\ 2\cdot 42 + 1\cdot 23$	$+\ 1\cdot 23 + 1\cdot 15$	$+\ \cdot 112 + \cdot 055$	$+\ \cdot 052 + \cdot 053$
e	$+\ 2\cdot 10 + 1\cdot 22$	$+\ 1\cdot 22 + \cdot 71$	$+\ \cdot 096 + \cdot 056$	$+\ \cdot 053 + \cdot 031$
d	$+\ 6\cdot 30 + 0\cdot 33$	$+\ \cdot 33 + \cdot 02$	$+\ \cdot 302 + \cdot 015$	$-\ \cdot 007 \quad \cdot 000$
b	$+\ 3\cdot 46 - 3\cdot 81$	$-\ 3\cdot 81 + 4\cdot 20$	$+\ \cdot 180 - \cdot 199$	$-\ \cdot 202 + \cdot 223$

NOTE.—In the above values of the corrections I_a, II_a, III_a, and IV_a, the star to which the co-efficients of x and y refer is indicated in the left hand margin on the same line in which the co-efficient is found. The same method is adopted in all the succeeding tables.

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To determine Star b. *Mag.* 8·2.

Pair.		Distances.	Weight.	v
		″		″
cb	50	$-\ \cdot21x_b - \cdot98y_b = +\ \cdot09$	4·1	$+\ \cdot11$
eb	102	$-\ \cdot53 - \cdot85 \quad -\ \cdot13$	3·1	$-\ \cdot08$
fb	138	$-\ \cdot64 - \cdot77 \quad -\ \cdot27$	1·8	$-\ \cdot32$
Eb	35	$-\ 1\cdot00 - \cdot10 \quad +\ \cdot31$	2·7	$+\ \cdot03$
db	61	$-\ \cdot75 - \cdot66 \quad +\ \cdot05$	5·0	$-\ \cdot01$
ab	51	$+\ \cdot67 - \cdot74 \quad -\ \cdot25$	7·7	$-\ \cdot08$
		Position-Angles.		
fb	138p	$-\ \cdot77x_b + \cdot64y_b = +\ \cdot44$	0·4	$+\ \cdot26$
		Meridian Observations.		
		$1\cdot00x_b + \cdot00y_b = +\ \cdot01$	3·3	$+\ \cdot07$
		$\cdot00 + 1\cdot00 = \cdot00$	10·8	$-\ \cdot08$

Normal Equations.

$$+\ 14\cdot30x_b + 1\cdot84y_b = -\ 1\cdot99 + \mathrm{I}_b$$
$$+\ 1\cdot84 + 24\cdot67 = +\ 1\cdot67 + \mathrm{II}_b$$

Solution. p'

$$x_b = -\ 0\cdot1493 + \mathrm{III}_b \qquad (14\cdot16)$$
$$y_b = +\ \cdot0788 + \mathrm{IV}_b \qquad (24\cdot43)$$

	I_b	II_b	III_b	IV_b
c	$+\ \cdot18x + \cdot83y$	$+\ \cdot83x + 3\cdot92y$	$+\ \cdot008x + \cdot038y$	$+\ \cdot033x + \cdot156y$
e	$+\ \cdot86 + 1\cdot40$	$+\ 1\cdot40 + 2\cdot25$	$+\ \cdot053 + \cdot087$	$+\ \cdot053 + \cdot085$
f	$+\ \cdot98 + \cdot69$	$+\ \cdot69 + 1\cdot22$	$+\ \cdot066 + \cdot042$	$+\ \cdot023 + \cdot046$
E	$+\ 2\cdot69 + \cdot26$	$+\ \cdot26 + \cdot03$	$+\ \cdot189 + \cdot018$	$-\ \cdot004 \quad \cdot000$
d	$+\ 2\cdot82 + 2\cdot49$	$+\ 2\cdot49 + 2\cdot19$	$+\ \cdot186 + \cdot164$	$+\ \cdot087 + \cdot077$
a	$+\ 3\cdot46 - 3\cdot83$	$-\ 3\cdot83 + 4\cdot24$	$+\ \cdot264 - \cdot293$	$-\ \cdot175 + \cdot194$

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To determine Star c. *Mag.* 8·5.

Pair.		Distances.	Weight.	v
gc	33	$-\ \cdot 93x_c - \cdot 38y_c = -\ \cdot 02''$	2·0	$+\ \cdot 11''$
kc	131	$-\ \cdot 94 - \cdot 34 - \cdot 25$	1·7	$-\ \cdot 22$
fc	2	$-\ \cdot 98 - \cdot 18 - \cdot 17$	3·1	$-\ \cdot 22$
mc	157	$-\ \cdot 99 - \cdot 13 - \cdot 21$	1·8	$-\ \cdot 10$
ec	7	$-\ \cdot 89 + \cdot 45 + \cdot 12$	7·5	$+\ \cdot 13$
Ec	86	$-\ \cdot 83 + \cdot 56 - \cdot 26$	2·4	$-\ \cdot 09$
dc	156	$-\ \cdot 37 + \cdot 93 + \cdot 03$	5·3	$-\ \cdot 04$
bc	50	$+\ \cdot 21 + \cdot 98 + \cdot 09$	4·1	$+\ \cdot 11$
ac	93	$+\ \cdot 64 + \cdot 77 - \cdot 09$	5·3	$-\ \cdot 11$
		Meridian Observations.		
		$1\cdot 00x_c - \cdot 00y_c = +\ \cdot 02$	3·1	$-\ \cdot 03$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	10·4	$-\ \cdot 03$

Normal Equations.

$$+\ 21\cdot 71x_c - 0\cdot 48y_c = +\ 0\cdot 82 + \mathrm{I}_c$$
$$-\ 0\cdot 48 + 24\cdot 88 = +\ \cdot 52 + \mathrm{II}_c$$

Solution. p'

$$x_c = +\ \cdot 0384 + \mathrm{III}_c \qquad (21\cdot 70)$$
$$y_c = +\ \cdot 0216 + \mathrm{IV}_c \qquad (24\cdot 87)$$

	I_c	II_c	III_c	IV_c
g	$+\ 1\cdot 72x + 0\cdot 71y$	$+\ 0\cdot 71x + 0\cdot 29y$	$+\ \cdot 080x + \cdot 033y$	$+\ \cdot 030x + \cdot 012y$
k	$+\ 1\cdot 49 + \cdot 54$	$+\ \cdot 54 + \cdot 19$	$+\ \cdot 069 + \cdot 025$	$+\ \cdot 023 + \cdot 008$
f	$+\ 2\cdot 96 + \cdot 55$	$+\ \cdot 55 + \cdot 10$	$+\ \cdot 137 + \cdot 026$	$+\ \cdot 025 + \cdot 005$
m	$+\ 1\cdot 77 + \cdot 23$	$+\ \cdot 23 + \cdot 03$	$+\ \cdot 082 + \cdot 011$	$+\ \cdot 011 + \cdot 001$
e	$+\ 5\cdot 95 - 3\cdot 00$	$-\ 3\cdot 00 + 1\cdot 51$	$+\ \cdot 271 - \cdot 137$	$-\ \cdot 115 + \cdot 058$
E	$+\ 1\cdot 66 - 1\cdot 12$	$-\ 1\cdot 12 + \cdot 76$	$+\ \cdot 076 - \cdot 051$	$-\ \cdot 044 + \cdot 030$
d	$+\ 0\cdot 72 - 1\cdot 82$	$-\ 1\cdot 82 + 4\cdot 58$	$+\ \cdot 032 - \cdot 080$	$-\ \cdot 073 + \cdot 183$
b	$+\ \cdot 18 + \cdot 83$	$+\ \cdot 83 + 3\cdot 92$	$+\ \cdot 009 + \cdot 042$	$+\ \cdot 033 + \cdot 158$
a	$+\ 2\cdot 16 + 2\cdot 60$	$+\ 2\cdot 60 + 3\cdot 13$	$+\ \cdot 102 + \cdot 123$	$+\ \cdot 107 + \cdot 128$

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To determine Star d. *Mag.* 8·4.

Pair.		Distances.	Weight.	v
		″		″
ed	166	$-\ \cdot17x_d - \cdot99y_d = +\ \cdot12$	6·9	+ ·13
gd	175	− ·56 − ·83 + ·09	2·0	+ ·14
fd	172	− ·56 − ·83 + ·09	5·6	+ ·06
hd	142	− ·60 − ·80 − ·29	3·2	− ·28
kd	126	− ·72 − ·70 − ·06	1·8	− ·05
id	103	− ·83 − ·55 + ·16	1·5	+ ·23
md	60	− ·85 − ·52 − ·18	3·7	− ·04
Ed	10	− ·97 + ·23 − ·09	5·4	− ·04
bd	61	+ ·75 + ·66 + ·05	5·0	− ·01
ad	9	+ 1·00 + ·05 + ·07	6·3	+ ·05
cd	156	+ ·37 − ·93 + ·03	5·3	− ·04
		Position-Angles.		
md	60p	$-\ \cdot52x_d + \cdot85y_d = +\ \cdot03$	2·3	+ ·08
		Meridian Observations.		
		$+\ 1\cdot00x_d + \cdot00y_d = +\ \cdot01$	4·8	− ·08
		·00 + 1·00 = ·00	12·2	+ ·03

Normal Equations.

$$+\ 28\cdot69x_d + 8\cdot27y_d = +\ 1\cdot65 + \mathrm{I}_d$$
$$+\ 8\cdot27 + 37\cdot32 = -\ \cdot38 + \mathrm{II}_d$$

Solution. p'

$$x_d = +\ \cdot0646 + \mathrm{III}_d \qquad (26\cdot86)$$
$$y_d = -\ \cdot0245 + \mathrm{IV}_d \qquad (34\cdot94)$$

	I_d	II_d	III_d	IV_d
e	$+\ 0\cdot20x + 1\cdot17y$	$+\ 1\cdot17x + 6\cdot76y$	$-\ \cdot002x - \cdot012y$	$+\ \cdot032x + \cdot184y$
g	+ ·64 + ·94	+ ·94 + 1·39	+ ·016 + ·024	+ ·022 + ·032
f	+ 1·77 + 2·62	+ 2·62 + 3·88	+ ·044 + ·066	+ ·060 + ·089
h	+ 1·14 + 1·53	+ 1·53 + 2·04	+ ·030 + ·040	+ ·034 + ·046
k	+ ·92 + ·90	+ ·90 + ·88	+ ·027 + ·026	+ ·018 + ·018
i	+ 1·04 + ·69	+ ·69 + ·46	+ ·033 + ·022	+ ·011 + ·007
m	+ 3·28 + ·61	+ ·61 + 2·66	+ ·117 + ·001	− ·010 + ·071
E	+ 5·06 − 1·19	− 1·19 + ·28	+ ·198 − ·047	− ·076 + ·018
b	+ 2·82 + 2·49	+ 2·49 + 2·19	+ ·084 + ·075	+ ·048 + ·042
a	+ 6·30 + ·33	+ ·33 + ·02	+ ·232 + ·012	− ·043 − ·002
ç	+ ·72 − 1·82	− 1·82 + 4·58	+ ·042 − ·105	− ·058 + ·146

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To determine Star e. *Mag.* 8·3.

Pair.		Distances.	Weight.	v
		"		"
ge	155	$-\ \cdot74x_e - \cdot67y_e = -\ \cdot02$	3·2	·00
he	125	$-\ \cdot75 - \cdot66 + \cdot09$	2·8	+ ·04
fe	122	$-\ \cdot82 - \cdot57 + \cdot15$	8·9	+ ·06
ke	101	$-\ \cdot85 - \cdot53 + \cdot09$	3·0	+ ·05
me	141	$-\ \cdot96 - \cdot28 + \cdot08$	6·9	+ ·14
ie	58	$-\ \cdot97 - \cdot26 - \cdot07$	2·2	− ·08
Ee	8	$-\ \cdot81 + \cdot58 - \cdot18$	5·4	− ·01
de	166	$+\ \cdot17 + \cdot99 + \cdot12$	6·9	+ ·13
be	102	$+\ \cdot53 + \cdot85 - \cdot13$	3·1	− ·08
ae	59	$+\ \cdot87 + \cdot50 + \cdot04$	2·8	+ ·11
ce	7	$+\ \cdot89 - \cdot45 + \cdot12$	7·5	+ ·13
		Position-Angles.		
fe	122*p*	$-\ \cdot57x_e + \cdot82y_e = +\ \cdot03$	0·5	− ·01
		Meridian Observations.		
		$+\ 1\cdot00x_e + \cdot00y_e = +\ \cdot01$	4·9	+ ·01
		$\cdot00 + 1\cdot00 = \cdot00$	12·2	+ ·02

Normal Equations.

$$+\ 37\cdot51x_e + 8\cdot89y_e = -\ 0\cdot21 + \mathrm{I}_e$$
$$+\ 8\cdot89 + 32\cdot65 = -\ 1\cdot59 + \mathrm{II}_e$$

Solution. p'

$$x = +\ \cdot0064 + \mathrm{III}_e \qquad (35\cdot09)$$
$$y_e = -\ \cdot0504 + \mathrm{IV}_e \qquad (30\cdot54)$$

	I_e	II_e	III_e	IV_e
g	$+\ 1\cdot74x + 1\cdot58y$	$+\ 1\cdot58x + 1\cdot44y$	$+\ \cdot037x + \cdot034y$	$+\ \cdot038x + \cdot035y$
h	$+\ 1\cdot56 + 1\cdot38$	$+\ 1\cdot38 + 1\cdot21$	$+\ \cdot034 + \cdot030$	$+\ \cdot033 + \cdot029$
f	$+\ 6\cdot11 + 3\cdot92$	$+\ 3\cdot92 + 3\cdot23$	$+\ \cdot144 + \cdot087$	$+\ \cdot081 + \cdot075$
k	$+\ 2\cdot16 + 1\cdot35$	$+\ 1\cdot35 + \cdot85$	$+\ \cdot051 + \cdot032$	$+\ \cdot027 + \cdot017$
m	$+\ 6\cdot35 + 1\cdot86$	$+\ 1\cdot86 + \cdot55$	$+\ \cdot166 + \cdot049$	$+\ \cdot012 + \cdot004$
i	$+\ 2\cdot07 + \cdot55$	$+\ \cdot55 + \cdot14$	$+\ \cdot055 + \cdot015$	$+\ \cdot002\quad \cdot000$
E	$+\ 3\cdot53 - 2\cdot54$	$-\ 2\cdot54 + 1\cdot82$	$+\ \cdot120 - \cdot087$	$-\ \cdot111 + \cdot079$
d	$+\ \cdot20 + 1\cdot17$	$+\ 1\cdot17 + 6\cdot76$	$-\ \cdot003 - \cdot019$	$+\ \cdot037 + \cdot212$
b	$+\ \cdot86 + 1\cdot40$	$+\ 1\cdot40 + 2\cdot25$	$+\ \cdot014 + \cdot022$	$+\ \cdot039 + \cdot063$
a	$+\ 2\cdot10 + 1\cdot22$	$+\ 1\cdot22 + \cdot71$	$+\ \cdot050 + \cdot029$	$+\ \cdot024 + \cdot014$
c	$+\ 5\cdot95 - 3\cdot00$	$-\ 3\cdot00 + 1\cdot51$	$+\ \cdot193 - \cdot097$	$-\ \cdot144 + \cdot073$

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To determine Star f. *Mag.* 7·5.

Pair.		Distances.	Weight.	v
gf	176	$-\ \cdot 56x_f - \cdot 83y_f = -\ \cdot 21$	6·7	$-\ \cdot 13$
lf	96	$-\ \cdot 57 - \cdot 82 - \cdot 35$	2·8	$-\ \cdot 13$
hf	171	$-\ \cdot 66 - \cdot 75 - \cdot 02$	4·9	$+\ \cdot 02$
kf	164	$-\ \cdot 87 - \cdot 50 + \cdot 04$	7·1	$+\ \cdot 10$
of	152	$-\ \cdot 93 - \cdot 37 - \cdot 32$	2·5	$-\ \cdot 08$
mf	95	$-\ 1\cdot 00 - \cdot 08 - \cdot 17$	10·8	$-\ \cdot 01$
if	52	$-\ 1\cdot 00 + \cdot 05 - \cdot 13$	2·9	$-\ \cdot 04$
nf	1	$-\ \cdot 92 + \cdot 40 - \cdot 25$	3·8	$-\ \cdot 03$
Ef	170	$-\ \cdot 47 + \cdot 88 - \cdot 54$	5·2	$-\ \cdot 12$
df	172	$+\ \cdot 57 + \cdot 82 + \cdot 09$	5·6	$+\ \cdot 06$
bf	138	$+\ \cdot 64 + \cdot 77 - \cdot 27$	1·8	$-\ \cdot 32$
ef	122	$+\ \cdot 82 + \cdot 57 + \cdot 15$	8·9	$+\ \cdot 06$
af	53	$+\ \cdot 85 + \cdot 52 + \cdot 00$	3·2	$-\ \cdot 04$
of	2	$+\ \cdot 98 + \cdot 18 - \cdot 17$	3·1	$-\ \cdot 22$
		Position-Angles.		
gf	176*p*	$-\ \cdot 83x_f + \cdot 56y = -\ \cdot 42$	0·5	$-\ \cdot 22$
lf	96*p*	$-\ \cdot 82 + \cdot 57 - \cdot 65$	0·4	$-\ \cdot 42$
kf	164*p*	$-\ \cdot 50 + \cdot 87 + \cdot 29$	0·5	$+\ \cdot 35$
mf	95*p*	$-\ \cdot 08 + 1\cdot 00 + \cdot 32$	0·5	$+\ \cdot 27$
Ef	170*p*	$+\ \cdot 88 + \cdot 47 - \cdot 36$	2·7	$-\ \cdot 09$
bf	138*p*	$+\ \cdot 77 - \cdot 64 + \cdot 44$	0·4	$+\ \cdot 26$
ef	122*p*	$+\ \cdot 57 - \cdot 82 + \cdot 03$	0·5	$-\ \cdot 01$
af	53*p*	$+\ \cdot 52 - \cdot 85 - \cdot 28$	0·4	$-\ \cdot 27$
		Meridian Observations.		
		$1\cdot 00x + \cdot 00y_f = -\ \cdot 02$	4·8	$-\ \cdot 12$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	11·6	$-\ \cdot 01$

Normal Equations.

$$+\ 52\cdot 59x_f + 17\cdot 35y_f = +\ 6\cdot 30 + \mathrm{I}_f$$
$$+\ 17\cdot 35 + 38\cdot 95 = -\ \cdot 29 + \mathrm{II}_f$$

Solution.

$$x_f = +\ \cdot 1434 + \mathrm{III}_f \qquad (44\cdot 86)$$
$$y_f = -\ \cdot 0713 + \mathrm{IV}_f \qquad (33\cdot 23)$$

	I_f	II_f	III_f	IV_f
g	$+\ 2\cdot 45x + 2\cdot 88y$	$+\ 2\cdot 88x + 4\cdot 78y$	$+\ \cdot 026x + \cdot 017y$	$+\ \cdot 062x + \cdot 115y$
l	$+\ 1\cdot 17 + 1\cdot 11$	$+\ 1\cdot 11 + 2\cdot 01$	$+\ \cdot 015 + \cdot 005$	$+\ \cdot 022 + \cdot 049$
h	$+\ 2\cdot 13 + 2\cdot 42$	$+\ 2\cdot 42 + 2\cdot 76$	$+\ \cdot 023 + \cdot 027$	$+\ \cdot 052 + \cdot 059$
k	$+\ 5\cdot 47 + 2\cdot 85$	$+\ 2\cdot 85 + 2\cdot 15$	$+\ \cdot 094 + \cdot 042$	$+\ \cdot 031 + \cdot 037$
o	$+\ 2\cdot 16 + \cdot 85$	$+\ \cdot 85 + \cdot 34$	$+\ \cdot 040 + \cdot 016$	$+\ \cdot 004 + \cdot 002$
m	$+10\cdot 82 + \cdot 82$	$+\ \cdot 82 + \cdot 57$	$+\ \cdot 233 + \cdot 013$	$-\ \cdot 083 + \cdot 009$
i	$+\ 2\cdot 89 - \cdot 15$	$-\ \cdot 15 + \cdot 01$	$+\ \cdot 066 - \cdot 003$	$-\ \cdot 033 + \cdot 002$
n	$+\ 3\cdot 20 - 1\cdot 40$	$-\ 1\cdot 40 + \cdot 61$	$+\ \cdot 085 - \cdot 037$	$-\ \cdot 074 + \cdot 032$
E	$+\ 3\cdot 21 - 1\cdot 04$	$-\ 1\cdot 04 + 4\cdot 63$	$+\ \cdot 082 - \cdot 069$	$-\ \cdot 063 + \cdot 150$
d	$+\ 1\cdot 82 + 2\cdot 62$	$+\ 2\cdot 62 + 3\cdot 76$	$+\ \cdot 015 + \cdot 021$	$+\ \cdot 061 + \cdot 087$
b	$+\ \cdot 98 + \cdot 69$	$+\ \cdot 69 + 1\cdot 22$	$+\ \cdot 015 + \cdot 003$	$+\ \cdot 011 + \cdot 030$
e	$+\ 6\cdot 11 + 3\cdot 92$	$+\ 3\cdot 92 + 3\cdot 23$	$+\ \cdot 097 + \cdot 055$	$+\ \cdot 057 + \cdot 058$
a	$+\ 2\cdot 42 + 1\cdot 23$	$+\ 1\cdot 23 + 1\cdot 15$	$+\ \cdot 042 + \cdot 016$	$+\ \cdot 013 + \cdot 022$
c	$+\ 2\cdot 96 + \cdot 55$	$+\ \cdot 55 + \cdot 10$	$+\ \cdot 061 + \cdot 011$	$-\ \cdot 013 - \cdot 002$

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To determine Star g. Mag. 8·5.

Pair.		Distances.	Weight.	v
		″		″
lg	84	$-\ \cdot58x_g - \cdot82y_g = -\ \cdot37$	2·4	$-\ \cdot24$
hg	149	$-\ \cdot79 - \cdot61 + \cdot14$	6·8	$+\ \cdot06$
kg	34	$-\ \cdot97 - \cdot25 + \cdot06$	4·3	$-\ \cdot04$
og	134	$-\ \cdot97 - \cdot25 - \cdot08$	2·0	$-\ \cdot02$
pg	177	$-\ 1\cdot00 - \cdot08 + \cdot17$	1·8	$+\ \cdot11$
mg	128	$-\ \cdot97 + \cdot24 + \cdot01$	3·7	$-\ \cdot04$
ig	115	$-\ \cdot84 + \cdot54 + \cdot19$	2·9	$+\ \cdot08$
ng	83	$-\ \cdot82 + \cdot57 + \cdot17$	1·9	$+\ \cdot18$
Eg	162	$-\ \cdot29 + \cdot96 - \cdot23$	2·1	$+\ \cdot15$
fg	176	$+\ \cdot56 + \cdot83 - \cdot21$	6·7	$-\ \cdot13$
dg	175	$+\ \cdot56 + \cdot83 + \cdot09$	2·0	$+\ \cdot14$
eg	155	$+\ \cdot74 + \cdot67 - \cdot02$	3·2	$\cdot00$
cg	33	$+\ \cdot93 + \cdot38 - \cdot02$	2·0	$+\ \cdot11$
		Position-Angles.		
fg	176p	$+\ \cdot83x_g - \cdot56y_g = -\ \cdot42$	0·5	$-\ \cdot22$
		Meridian Observations.		
		$1\cdot00x_g + \cdot00y_g = +\ \cdot02$	4·1	$+\ \cdot12$
		$\cdot00 + 1\cdot00 = \cdot00$	10·6	$-\ \cdot05$

Normal Equations.

$$+\ 30\cdot34x_g + 8\cdot54y_g = -\ 2\cdot14 + \mathrm{I}_g$$
$$+\ 8\cdot54 + 26\cdot66 = -\ 0\cdot86 + \mathrm{II}_g$$

Solution. p'

$$x_g = -\ \cdot0676 + \mathrm{III}_g \qquad (27\cdot60)$$
$$y_g = -\ \cdot0106 + \mathrm{IV}_g \qquad (24\cdot26)$$

	I_g	II_g	III_g	IV_g
l	$+\ \cdot81x + 1\cdot14y$	$+\ 1\cdot14x + 1\cdot61y$	$+\ \cdot016x + \cdot023y$	$+\ \cdot038x + \cdot053y$
h	$+\ 4\cdot24 + 3\cdot28$	$+\ 3\cdot28 + 2\cdot53$	$+\ \cdot116 + \cdot089$	$+\ \cdot086 + \cdot066$
k	$+\ 4\cdot04 + 1\cdot05$	$+\ 1\cdot05 + \cdot27$	$+\ \cdot134 + \cdot035$	$-\ \cdot004 - \cdot001$
o	$+\ 1\cdot88 + \cdot48$	$+\ \cdot48 + \cdot12$	$+\ \cdot063 + \cdot016$	$-\ \cdot002 - \cdot001$
p	$+\ 1\cdot80 + \cdot15$	$+\ \cdot15 + \cdot01$	$+\ \cdot064 + \cdot005$	$-\ \cdot015 - \cdot001$
m	$+\ 3\cdot46 - \cdot86$	$-\ \cdot86 + \cdot21$	$+\ \cdot135 - \cdot033$	$-\ \cdot076 + \cdot018$
i	$+\ 2\cdot04 - 1\cdot32$	$-\ 1\cdot32 + \cdot85$	$+\ \cdot089 - \cdot058$	$-\ \cdot078 + \cdot050$
n	$+\ 1\cdot28 - \cdot89$	$-\ \cdot89 + \cdot62$	$+\ \cdot057 - \cdot039$	$-\ \cdot052 + \cdot036$
E	$+\ \cdot18 - \cdot58$	$-\ \cdot58 + 1\cdot93$	$+\ \cdot013 - \cdot043$	$-\ \cdot026 + \cdot086$
f	$+\ 2\cdot45 + 2\cdot88$	$+\ 2\cdot88 + 4\cdot78$	$+\ \cdot055 + \cdot049$	$+\ \cdot090 + \cdot164$
d	$+\ \cdot62 + \cdot92$	$+\ \cdot92 + 1\cdot37$	$+\ \cdot012 + \cdot017$	$+\ \cdot031 + \cdot046$
e	$+\ 1\cdot74 + 1\cdot58$	$+\ 1\cdot58 + 1\cdot44$	$+\ \cdot045 + \cdot041$	$+\ \cdot045 + \cdot041$
c	$+\ 1\cdot72 + \cdot71$	$+\ \cdot71 + \cdot29$	$+\ \cdot054 + \cdot022$	$+\ \cdot009 + \cdot004$

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To determine Star h. *Mag.* 7·8.

Pair.		Distances.	Weight.	v
		″		″
kh	76	$-1{\cdot}00x_h - {\cdot}02y_h = -{\cdot}03$	6·3	$-{\cdot}03$
ph	153	$-1{\cdot}00 \quad {\cdot}00 \quad -{\cdot}12$	2·1	$-{\cdot}07$
mh	144	$-{\cdot}88 \quad +{\cdot}47 \quad +{\cdot}01$	3·5	$+{\cdot}04$
nh	92	$-{\cdot}74 \quad +{\cdot}67 \quad +{\cdot}04$	2·1	$+{\cdot}12$
ih	49	$-{\cdot}58 \quad +{\cdot}81 \quad +{\cdot}01$	3·6	$-{\cdot}01$
Eh	135	$-{\cdot}17 \quad +{\cdot}99 \quad -{\cdot}19$	1·4	$+{\cdot}27$
dh	142	$+{\cdot}60 \quad +{\cdot}80 \quad -{\cdot}29$	3·2	$-{\cdot}28$
fh	171	$+{\cdot}66 \quad +{\cdot}75 \quad -{\cdot}02$	4·8	$+{\cdot}02$
eh	125	$+{\cdot}75 \quad +{\cdot}66 \quad +{\cdot}09$	2·8	$+{\cdot}04$
gh	149	$+{\cdot}79 \quad +{\cdot}61 \quad +{\cdot}14$	6·8	$+{\cdot}06$
		Meridian Observations.		
		$+1{\cdot}00x_h + {\cdot}00y_h = -{\cdot}01$	3·3	$-{\cdot}02$
		${\cdot}00 \quad +1{\cdot}00 = {\cdot}00$	8·1	$-{\cdot}03$

Normal Equations.

$$+25{\cdot}86x_h + 4{\cdot}28y_h = +0''{\cdot}67 + \mathrm{I}_h$$
$$+4{\cdot}28 + 22{\cdot}04 = -0''{\cdot}21 + \mathrm{II}_h$$

Solution. p'

$$x_h = +0''{\cdot}0284 + \mathrm{III}_h \qquad (25{\cdot}03)$$
$$y_h = -0''{\cdot}0150 + \mathrm{IV}_h \qquad (21{\cdot}33)$$

	I_h		II_h		III_h		IV_h	
k	$+6{\cdot}30x$	$+{\cdot}13y$	$+{\cdot}13x$	${\cdot}00y$	$+{\cdot}251x$	$+{\cdot}005y$	$-{\cdot}043x$	$-{\cdot}001y$
p	$+2{\cdot}10$	${\cdot}00$	${\cdot}00$	${\cdot}00$	$+{\cdot}084$	${\cdot}000$	$-{\cdot}016$	${\cdot}000$
m	$+2{\cdot}72$	$-1{\cdot}45$	$-1{\cdot}45$	$+{\cdot}77$	$+{\cdot}120$	$-{\cdot}064$	$-{\cdot}089$	$+{\cdot}047$
n	$+1{\cdot}14$	$-1{\cdot}04$	$-1{\cdot}04$	$+{\cdot}94$	$+{\cdot}054$	$-{\cdot}049$	$-{\cdot}058$	$+{\cdot}052$
i	$+1{\cdot}21$	$-1{\cdot}69$	$-1{\cdot}69$	$+2{\cdot}37$	$+{\cdot}061$	$-{\cdot}086$	$-{\cdot}089$	$+{\cdot}124$
E	$+{\cdot}04$	$-{\cdot}23$	$-{\cdot}23$	$+1{\cdot}37$	$+{\cdot}003$	$-{\cdot}020$	$-{\cdot}011$	$+{\cdot}066$
d	$+1{\cdot}14$	$+1{\cdot}53$	$+1{\cdot}53$	$+2{\cdot}04$	$+{\cdot}034$	$+{\cdot}045$	$+{\cdot}063$	$+{\cdot}084$
f	$+2{\cdot}10$	$+2{\cdot}38$	$+2{\cdot}38$	$+2{\cdot}69$	$+{\cdot}065$	$+{\cdot}074$	$+{\cdot}095$	$+{\cdot}108$
e	$+1{\cdot}56$	$+1{\cdot}37$	$+1{\cdot}37$	$+1{\cdot}21$	$+{\cdot}052$	$+{\cdot}045$	$+{\cdot}052$	$+{\cdot}046$
g	$+4{\cdot}24$	$+3{\cdot}28$	$+3{\cdot}28$	$+2{\cdot}53$	$+{\cdot}144$	$+{\cdot}111$	$+{\cdot}121$	$+{\cdot}093$

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To determine Star i. *Mag.* 7·7.

Pair.		Distances.	Weight.	v
		″		″
ki	24	$-\ \cdot 11x_i - \cdot 99y_i = +\ \cdot 05$	3·2	+ ·02
mi	69	$-\ \cdot 93 - \cdot 38 \quad - \cdot 11$	3·8	− ·03
pi	165	$-\ \cdot 94 - \cdot 34 \quad + \cdot 06$	1·9	+ ·08
ni	47	$-\ \cdot 81 + \cdot 59 \quad - \cdot 09$	2·5	+ ·02
Ei	116	$+\ \cdot 04 + 1\cdot 00 \quad - \cdot 50$	2·2	+ ·02
di	103	$+\ \cdot 83 + \cdot 55 \quad + \cdot 16$	1·5	+ ·23
ei	58	$+\ \cdot 97 + \cdot 26 \quad - \cdot 07$	2·2	− ·08
fi	52	$+\ 1\cdot 00 - \cdot 05 \quad - \cdot 13$	2·9	− ·04
gi	115	$+\ \cdot 84 - \cdot 54 \quad + \cdot 19$	2·9	+ ·08
hi	49	$+\ \cdot 58 - \cdot 81 \quad + \cdot 01$	3·6	− ·01
		Position-Angles.		
Ei	116*p*	$+\ 1\cdot 00x_i - \cdot 04y_i = -\ \cdot 21$	0·4	− ·07
		Meridian Observations.		
		$1\cdot 00x_i + \cdot 00y_i = -\ \cdot 01$	3·8	− ·02
		$\cdot 00 + 1\cdot 00 = \cdot 00$	9·7	·00

Normal Equations.

$$+\ 20\cdot 08x_i - 0\cdot 75y_i = +\ 0''\cdot 45 + \mathrm{I}_i$$
$$-\ 0\cdot 75 + 20\cdot 44 = -\ 1''\cdot 48 + \mathrm{II}_i$$

Solution. *p′*

$$x_i = +\ 0''\cdot 0197 + \mathrm{III}_i \qquad (20\cdot 05)$$
$$y_i = -\ \cdot 0717 + \mathrm{IV}_i \qquad (20\cdot 41)$$

	I_i	II_i	III_i	IV_i
k	$+\ \cdot 04x + \cdot 35y$	$+\ \cdot 35x + 3\cdot 13y$	$+\ \cdot 003x + \cdot 023y$	$+\ \cdot 017x + \cdot 154y$
m	$+\ 3\cdot 28 + 1\cdot 34$	$+\ 1\cdot 34 + \cdot 55$	$+\ \cdot 166 + \cdot 068$	$+\ \cdot 072 + \cdot 029$
p	$+\ 1\cdot 69 + \cdot 61$	$+\ \cdot 61 + \cdot 22$	$+\ \cdot 086 + \cdot 031$	$+\ \cdot 033 + \cdot 012$
n	$+\ 1\cdot 64 - 1\cdot 19$	$-\ 1\cdot 19 + \cdot 86$	$+\ \cdot 080 - \cdot 058$	$-\ \cdot 055 + \cdot 040$
E	$+\ \cdot 40 + \cdot 07$	$+\ \cdot 07 + 2\cdot 19$	$+\ \cdot 020 - \cdot 007$	$+\ \cdot 005 + \cdot 107$
d	$+\ 1\cdot 02 + \cdot 68$	$+\ \cdot 68 + \cdot 45$	$+\ \cdot 052 + \cdot 035$	$+\ \cdot 035 + \cdot 023$
e	$+\ 2\cdot 07 + \cdot 55$	$+\ \cdot 55 + \cdot 14$	$+\ \cdot 104 + \cdot 028$	$+\ \cdot 031 + \cdot 008$
f	$+\ 2\cdot 89 - \cdot 15$	$-\ \cdot 15 + \cdot 01$	$+\ \cdot 144 - \cdot 007$	$-\ \cdot 002 \quad \cdot 000$
g	$+\ 2\cdot 04 - 1\cdot 32$	$-\ 1\cdot 32 + \cdot 85$	$+\ \cdot 099 - \cdot 064$	$-\ \cdot 061 + \cdot 039$
h	$+\ 1\cdot 21 - 1\cdot 69$	$-\ 1\cdot 69 + 2\cdot 37$	$+\ \cdot 057 - \cdot 080$	$-\ \cdot 081 + \cdot 113$

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To determine Star k. *Mag.* 7·9.

Pair.		Distances.	Weight.	v
lk	23	$-\ \cdot 14x_k - \cdot 99y_k = +\ \cdot 08$	2·8	+ ·18
ok	110	− ·97 − ·25 − ·26	3·4	− ·10
pk	55	− 1·00 ·00 − ·10	3·6	− ·05
nk	75	− ·61 + ·79 − ·04	1·8	+ ·02
mk	17	− ·58 + ·81 + ·09	9·8	+ ·07
Ek	150	+ ·06 + 1·00 − ·54	1·8	− ·03
ik	24	+ ·11 + ·99 + ·05	3·2	+ ·02
dk	126	+ ·72 + ·70 − ·06	1·8	− ·05
ek	101	+ ·85 + ·53 + ·09	3·0	+ ·05
fk	164	+ ·87 + ·50 + ·04	7·1	+ ·10
ck	131	+ ·94 + ·34 − ·25	1·7	− ·22
gk	34	+ ·97 + ·25 + ·06	4·3	− ·04
hk	76	+ 1·00 + ·02 − ·03	6·3	− ·03
		Position-Angles.		
fk	164p	$+\ \cdot 50x_k - \cdot 87y_k = +\ \cdot 29$	0·5	+ ·35
		Meridian Observations.		
		$+\ 1\cdot 00x_k + \cdot 00y_k = \cdot 00$	4·0	− ·02
		·00 + 1·00 = ·00	10·8	− ·03

Normal Equations.

$$+\ 35\cdot 24x_k + 2\cdot 99y_k = +\ 0\cdot 80 + \mathrm{I}_k$$
$$+\ 2\cdot 99 + 30\cdot 59 = -\ \cdot 13 + \mathrm{II}_k$$

Solution. p'

$$x_k = +\ \cdot 0226 + \mathrm{III}_k \qquad (34\cdot 95)$$
$$y_k = -\ \cdot 0065 + \mathrm{IV}_k \qquad (30\cdot 34)$$

	I_k	II_k	III_k	IV_k
l	+ ·05x + ·38y	+ ·38x + 2·72y	·000x + ·003y	+ ·012x + ·089y
o	+ 3·17 + ·82	+ ·82 + ·21	+ ·088 + ·023	+ ·018 + ·005
p	+ 3·61 ·00	·00 ·00	+ ·103 ·000	− ·010 ·000
n	+ ·67 − ·87	− ·87 + 1·12	+ ·022 − ·028	− ·031 + ·039
m	+ 3·31 − 4·62	− 4·62 + 6·45	+ ·107 − ·150	− ·162 + ·225
E	+ ·01 + ·11	+ ·11 + 1·80	·000 − ·002	+ ·004 + ·059
i	+ ·04 + ·35	+ ·35 + 3·13	·000 + ·001	+ ·011 + ·102
d	+ ·92 + ·90	+ ·90 + ·88	+ ·024 + ·023	+ ·027 + ·027
e	+ 2·16 + 1·35	+ 1·35 + ·85	+ ·058 + ·036	+ ·038 + ·024
f	+ 5·47 + 2·85	+ 2·85 + 2·15	+ ·148 + ·075	+ ·079 + ·063
c	+ 1·49 + ·54	+ ·54 + ·19	+ ·041 + ·015	+ ·014 + ·005
g	+ 4·04 + 1·05	+ 1·05 + ·27	+ ·112 + ·029	+ ·023 + ·006
h	+ 6·30 + ·13	+ ·13 ·09	+ ·179 + ·004	− ·013 ·000

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To determine Star l. *Mag.* 8·0.

Pair.		Distances.	Weight.	v
		″		″
pl	4	$-\ \cdot 81x_l + \cdot 59y_l = +\ \cdot 11$	1·9	$+\ \cdot 02$
ml	106	$-\ \cdot 11 + \cdot 99 -\ \cdot 05$	2·4	$-\ \cdot 07$
kl	23	$+\ \cdot 14 + \cdot 99 +\ \cdot 08$	2·8	$+\ \cdot 18$
gl	84	$+\ \cdot 58 + \cdot 82 -\ \cdot 37$	2·4	$-\ \cdot 24$
fl	96	$+\ \cdot 57 + \cdot 82 -\ \cdot 35$	2·8	$-\ \cdot 13$
		Position-Angles.		
fl	96*p*	$+\ \cdot 82x_l + \cdot 57y = -\ \cdot 65$	0·4	$-\ \cdot 42$
		Meridian Observations.		
		$+\ 1\cdot 00x_l + \cdot 00y_l =\ \cdot 00$	3·1	$+\ \cdot 20$
		$\cdot 00 + 1\cdot 00 =\ \cdot 00$	8·2	$+\ \cdot 04$

Normal Equations.

$$+\ 6\cdot 41x_l + 1\cdot 46y_l = -\ 1\cdot 40 + \mathrm{I}_l$$
$$+\ 1\cdot 46 + 17\cdot 52 = -\ 1\cdot 15 + \mathrm{II}_l$$

Solution. p'

$$x_l = -\ \cdot 2074 + \mathrm{III}_l \qquad (6\cdot 29)$$
$$y_l = -\ \cdot 0484 + \mathrm{IV}_l \qquad (17\cdot 19)$$

	I_l	II_l	III_l	IV_l
p	$+\ 1\cdot 25x - \cdot 91y$	$-\ \cdot 91x + \cdot 66y$	$+\ \cdot 211x - \cdot 154y$	$-\ \cdot 070x + \cdot 050y$
m	$+\ \cdot 03 -\ \cdot 26$	$-\ \cdot 26 + 2\cdot 34$	$+\ \cdot 008 -\ \cdot 072$	$-\ \cdot 016 + \cdot 140$
k	$+\ \cdot 05 +\ \cdot 38$	$+\ \cdot 38 + 2\cdot 72$	$+\ \cdot 003 +\ \cdot 024$	$+\ \cdot 021 + \cdot 153$
g	$+\ \cdot 81 + 1\cdot 14$	$+\ 1\cdot 14 + 1\cdot 61$	$+\ \cdot 114 +\ \cdot 160$	$+\ \cdot 056 + \cdot 079$
f	$+\ 1\cdot 17 + 1\cdot 11$	$+\ 1\cdot 11 + 2\cdot 01$	$+\ \cdot 171 +\ \cdot 150$	$+\ \cdot 049 + \cdot 102$

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To determine Star m. *Mag.* 5·7.

Pair.		Distances.	Weight.	v
om	68	$-\ \cdot 78x_m - \cdot 63y = -\ \cdot 07''$	3·5	$-\ \cdot 01''$
pm	173	$-\ \cdot 95 - \cdot 33 + \cdot 05$	8·2	·00
qm	100	$-\ 1\cdot 00 - \cdot 06 + \cdot 20$	6·2	$+\ \cdot 09$
nm	18	$-\ \cdot 62 + \cdot 79 - \cdot 11$	6·2	$-\ \cdot 04$
Em	85	$+\ \cdot 25 + \cdot 97 - \cdot 60$	6·0	·00
dm	60	$+\ \cdot 85 + \cdot 52 - \cdot 18$	3·7	$-\ \cdot 04$
im	69	$+\ \cdot 93 + \cdot 38 - \cdot 11$	3·8	$-\ \cdot 03$
em	141	$+\ \cdot 96 + \cdot 28 + \cdot 08$	6·9	$+\ \cdot 14$
cm	157	$+\ \cdot 99 + \cdot 13 - \cdot 21$	1·8	$-\ \cdot 10$
fm	95	$+\ 1\cdot 00 + \cdot 08 - \cdot 17$	10·8	$-\ \cdot 01$
gm	128	$+\ \cdot 97 - \cdot 24 + \cdot 01$	3·7	$-\ \cdot 04$
hm	144	$+\ \cdot 88 - \cdot 47 + \cdot 01$	3·5	$+\ \cdot 04$
km	17	$+\ \cdot 59 - \cdot 81 + \cdot 09$	9·8	$+\ \cdot 07$
lm	106	$+\ \cdot 11 - \cdot 99 - \cdot 05$	2·4	$-\ \cdot 07$
		Position-Angles.		
gm	100*p*	$-\ \cdot 06x_m + 1\cdot 00y_m = +\ \cdot 35$	0·5	$+\ \cdot 46$
Em	85*p*	$+\ \cdot 97 - \cdot 25 - \cdot 20$	2·9	$-\ \cdot 13$
dm	60*p*	$+\ \cdot 52 - \cdot 85 + \cdot 03$	2·3	$+\ \cdot 08$
fm	95*p*	$+\ \cdot 08 - 1\cdot 00 + \cdot 32$	0·5	$+\ \cdot 27$
		Meridian Observations.		
		$+\ 1\cdot 00x_m + \cdot 00y_m = -\ \cdot 08$	4·7	$-\ \cdot 03$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	12·4	$+\ \cdot 04$

Normal Equations.

$$+\ 61\cdot 03x_m + 0\cdot 08y_m = -\ 4\cdot 86 + \mathrm{I}_m$$
$$-\ 0\cdot 08 + 39\cdot 03 = -\ 5\cdot 15 + \mathrm{II}_m$$

Solution. p'

$$x_m = -\ \cdot 0798 + \mathrm{III}_m \qquad (61\cdot 03)$$
$$y_m = -\ \cdot 1321 + \mathrm{IV}_m \qquad (39\cdot 03)$$

	I_m	II_m	III_m	IV_m
o	$+\ 2\cdot 13x + 1\cdot 72y$	$+\ 1\cdot 72x + 1\cdot 39y$	$+\ \cdot 035x + \cdot 028y$	$+\ \cdot 044x + \cdot 036y$
p	$+\ 7\cdot 40 + 2\cdot 56$	$+\ 2\cdot 56 + \cdot 88$	$+\ \cdot 121 + \cdot 042$	$+\ \cdot 066 + \cdot 023$
q	$+\ 6\cdot 20 + \cdot 34$	$+\ \cdot 34 + \cdot 52$	$+\ \cdot 102 + \cdot 006$	$+\ \cdot 009 + \cdot 013$
n	$+\ 2\cdot 37 - 3\cdot 03$	$-\ 3\cdot 03 + 3\cdot 88$	$+\ \cdot 039 - \cdot 049$	$-\ \cdot 078 + \cdot 099$
E	$+\ 3\cdot 09 + \cdot 74$	$+\ \cdot 74 + 5\cdot 84$	$+\ \cdot 051 + \cdot 012$	$+\ \cdot 019 + \cdot 150$
d	$+\ 3\cdot 28 + \cdot 61$	$+\ \cdot 61 + 2\cdot 66$	$+\ \cdot 054 + \cdot 010$	$+\ \cdot 016 + \cdot 068$
i	$+\ 3\cdot 28 + 1\cdot 34$	$+\ 1\cdot 34 + \cdot 55$	$+\ \cdot 054 + \cdot 022$	$+\ \cdot 034 + \cdot 014$
e	$+\ 6\cdot 35 + 1\cdot 86$	$+\ 1\cdot 86 + \cdot 55$	$+\ \cdot 104 + \cdot 030$	$+\ \cdot 048 + \cdot 014$
c	$+\ 1\cdot 77 + \cdot 23$	$+\ \cdot 23 + \cdot 03$	$+\ \cdot 029 + \cdot 004$	$+\ \cdot 006 + \cdot 001$
f	$+10\cdot 82 + \cdot 82$	$+\ \cdot 82 + \cdot 57$	$+\ \cdot 177 + \cdot 013$	$+\ \cdot 021 + \cdot 015$
g	$+\ 3\cdot 46 - \cdot 86$	$-\ \cdot 86 + \cdot 21$	$+\ \cdot 057 - \cdot 014$	$-\ \cdot 022 + \cdot 005$
h	$+\ 2\cdot 72 - 1\cdot 45$	$-\ 1\cdot 45 + \cdot 77$	$+\ \cdot 044 - \cdot 024$	$-\ \cdot 037 + \cdot 020$
k	$+\ 3\cdot 42 - 4\cdot 70$	$-\ 4\cdot 70 + 6\cdot 45$	$+\ \cdot 056 - \cdot 077$	$-\ \cdot 120 + \cdot 165$
l	$+\ \cdot 03 - \cdot 26$	$-\ \cdot 26 + 2\cdot 34$	$\cdot 000 - \cdot 004$	$-\ \cdot 007 + \cdot 060$

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To determine Star n. *Mag.* 6·6.

Pair.		Distances.	Weight.	v
		″		″
on	48	$-\ \cdot08x_n - 1\cdot00y_n = -\ \cdot22$	3·0	$-\ \cdot16$
pn	174	$-\ \cdot31 - \cdot95 + \cdot12$	6·7	$+\ \cdot04$
qn	154	$-\ \cdot80 - \cdot60 + \cdot26$	5·4	$+\ \cdot05$
sn	39	$-\ \cdot99 - \cdot11 + \cdot20$	3·9	$+\ \cdot09$
En	36	$+\ \cdot89 + \cdot46 - \cdot49$	5·4	$+\ \cdot04$
fn	1	$+\ \cdot92 - \cdot40 - \cdot25$	3·8	$-\ \cdot03$
gn	83	$+\ \cdot82 - \cdot57 + \cdot17$	1·9	$+\ \cdot18$
in	47	$+\ \cdot81 - \cdot59 - \cdot09$	2·5	$+\ \cdot02$
hn	92	$+\ \cdot74 - \cdot67 + \cdot04$	2·0	$+\ \cdot12$
mn	18	$+\ \cdot62 - \cdot79 - \cdot11$	6·1	$-\ \cdot04$
kn	75	$+\ \cdot61 - \cdot79 - \cdot04$	1·7	$+\ \cdot02$
		Meridian Observations.		
		$+\ 1\cdot00x_n + \cdot00y_n = -\ \cdot05$	3·8	$+\ \cdot08$
		$\cdot00 + 1\cdot00 = \cdot00$	10·3	$+\ \cdot01$

Normal Equations.

$$+\ 26\cdot12x_n - 0\cdot82y_n = -\ 5\cdot83 + \mathrm{I}_n$$
$$-\ 0\cdot82 + 30\cdot29 = -\ 1\cdot38 + \mathrm{II}_n$$

Solution. *p′*

$$x_n = -\ \cdot2248 + \mathrm{III}_n \qquad (26\cdot10)$$
$$y_n = -\ \cdot0517 + \mathrm{IV}_n \qquad (30\cdot26)$$

	I_n	II_n	III_n	IV_n
o	$+\ \cdot02x + \cdot24y$	$+\ \cdot24x + 2\cdot99y$	$+\ \cdot001x + \cdot012y$	$+\ \cdot008x + \cdot099y$
p	$+\ \cdot64 + 1\cdot97$	$+\ 1\cdot97 + 6\cdot05$	$+\ \cdot027 + \cdot082$	$+\ \cdot066 + \cdot202$
q	$+\ 3\cdot46 + 2\cdot59$	$+\ 2\cdot59 + 1\cdot93$	$+\ \cdot135 + \cdot101$	$+\ \cdot089 + \cdot066$
s	$+\ 3\cdot80 + \cdot43$	$+\ \cdot43 + \cdot05$	$+\ \cdot146 + \cdot017$	$+\ \cdot018 + \cdot002$
E	$+\ 4\cdot24 + 2\cdot20$	$+\ 2\cdot20 + 1\cdot14$	$+\ \cdot165 + \cdot085$	$+\ \cdot077 + \cdot040$
f	$+\ 3\cdot20 - 1\cdot40$	$-\ 1\cdot40 + \cdot61$	$+\ \cdot121 - \cdot053$	$-\ \cdot043 + \cdot019$
g	$+\ 1\cdot28 - \cdot89$	$-\ \cdot89 + \cdot62$	$+\ \cdot048 - \cdot033$	$-\ \cdot028 + \cdot020$
i	$+\ 1\cdot64 - 1\cdot19$	$-\ 1\cdot19 + \cdot86$	$+\ \cdot062 - \cdot045$	$-\ \cdot037 + \cdot027$
h	$+\ 1\cdot08 - \cdot98$	$-\ \cdot98 + \cdot88$	$+\ \cdot040 - \cdot037$	$-\ \cdot031 + \cdot028$
m	$+\ 2\cdot34 - 2\cdot98$	$-\ 2\cdot98 + 3\cdot80$	$+\ \cdot087 - \cdot110$	$-\ \cdot096 + \cdot122$
k	$+\ \cdot62 - \cdot81$	$-\ \cdot81 + 1\cdot06$	$+\ \cdot023 - \cdot033$	$-\ \cdot026 + \cdot034$

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To determine Star o. *Mag.* 7·6.

Pair.		Distances.	Weight.	v
	′	″		″
ro	41	$-\ \cdot97x_o - \cdot23y_o = +\ \cdot32$	2·9	$+\ \cdot08$
qo	5	$-\ \cdot91 + \cdot41 - \cdot15$	3·9	$-\ \cdot24$
po	98	$-\ \cdot71 + \cdot70 + \cdot04$	8·7	$+\ \cdot06$
no	48	$+\ \cdot08 + 1\cdot00 - \cdot22$	3·0	$-\ \cdot16$
mo	68	$+\ \cdot78 + \cdot63 - \cdot07$	3·5	$-\ \cdot01$
fo	152	$+\ \cdot93 + \cdot37 - \cdot32$	2·5	$-\ \cdot08$
ko	110	$+\ \cdot97 + \cdot25 - \cdot26$	3·4	$-\ \cdot10$
go	134	$+\ \cdot97 + \cdot25 - \cdot08$	2·0	$-\ \cdot02$
		Meridian Observations.		
		$+\ 1\cdot00x_o + \cdot00y_o = -\ \cdot02$	3·1	$+\ \cdot10$
		$\cdot00 + 1\cdot00 = \cdot00$	8·9	$+\ \cdot08$

Normal Equations.

$$+22\cdot75x_o - 1\cdot03y_o = -\ 2\cdot66 + \mathrm{I}_o$$
$$-\ 1\cdot03 + 19\cdot02 = -\ 1\cdot56 + \mathrm{II}_o$$

Solution. p'

$$x_o = -\ \cdot1210 + \mathrm{III}_o \qquad (22\cdot69)$$
$$y_o = -\ \cdot0885 + \mathrm{IV}_o \qquad (18\cdot97)$$

	I_o	II_o	III_o	IV_o
r	$+\ 2\cdot72x + \cdot64y$	$+\ \cdot64x + \cdot15y$	$+\ \cdot121x + \cdot029y$	$+\ \cdot040x + \cdot009y$
q	$+\ 3\cdot20 - 1\cdot45$	$-\ 1\cdot45 + \cdot66$	$+\ \cdot137 - \cdot062$	$-\ \cdot069 + \cdot031$
p	$+\ 4\cdot37 - 4\cdot33$	$-\ 4\cdot33 + 4\cdot28$	$+\ \cdot182 - \cdot181$	$-\ \cdot218 + \cdot215$
n	$+\ \cdot02 + \cdot24$	$+\ \cdot24 + 2\cdot99$	$+\ \cdot001 + \cdot018$	$+\ \cdot013 + \cdot158$
m	$+\ 2\cdot13 + 1\cdot72$	$+\ 1\cdot72 + 1\cdot39$	$+\ \cdot098 + \cdot079$	$+\ \cdot096 + \cdot077$
f	$+\ 2\cdot16 + \cdot85$	$+\ \cdot85 + \cdot34$	$+\ \cdot097 + \cdot038$	$+\ \cdot050 + \cdot020$
k	$+\ 3\cdot17 + \cdot82$	$+\ \cdot82 + \cdot21$	$+\ \cdot142 + \cdot037$	$+\ \cdot051 + \cdot013$
g	$+\ 1\cdot88 + \cdot48$	$+\ \cdot48 + \cdot12$	$+\ \cdot084 + \cdot021$	$+\ \cdot030 + \cdot007$

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To determine Star p. *Mag.* 7·6.

Pair.		Distances.	Weight.	v
		″		″
rp	139	$-\ \cdot 90x_p - \cdot 44y_p = +\ \cdot 17$	4·7	+ ·07
tp	123	− ·99 + ·13 + ·09	16·0	+ ·07
up	97	− ·99 + ·13 + ·01	1·5	+ ·01
qp	54	− ·96 + ·27 + ·06	8·0	·00
sp	3	− ·84 + ·54 − ·10	3·6	− ·09
np	174	+ ·30 + ·95 + ·12	6·7	+ ·04
ip	165	+ ·94 + ·34 + ·06	1·9	+ ·08
mp	173	+ ·95 + ·33 + ·05	8·2	·00
gp	177	+ 1·00 + ·08 + ·17	1·8	+ ·11
hp	153	+ 1·00 ·00 − ·12	2·1	− ·07
kp	55	+ 1·00 ·00 − ·10	3·6	− ·05
lp	4	+ ·81 − ·59 + ·11	1·9	+ ·02
op	98	+ ·71 − ·70 + ·04	8·7	+ ·06
		Position-Angles.		
tp	123 *p*	$+\ \cdot 13x_p + \cdot 99y_p = +\ \cdot 15$	8·0	+ ·09
		Meridian Observations.		
		$+\ 1\cdot 00x_p + \cdot 00y_p = -\ \cdot 01$	7·0	+ ·02
		·00 + 1·00 = ·00	16·6	− ·03

Normal Equations.

$$+60\cdot 89x_p - 3\cdot 08y_p = -\ 1\cdot 40 + \mathrm{I}_p$$
$$-\ 3\cdot 08 \quad +39\cdot 34 = +\ 1\cdot 54 + \mathrm{II}_p$$

Solution. *p′*

$$x_p = -\ \cdot 0211 + \mathrm{III}_p \qquad (60\cdot 65)$$
$$y_p = +\ \cdot 0375 + \mathrm{IV}_p \qquad (39\cdot 18)$$

	I_p	II_p	III_p	IV_p
r	$+\ 3\cdot 80x + 1\cdot 85y$	$+\ 1\cdot 85x + \cdot 90y$	$+\ \cdot 065x + \cdot 032y$	$+\ \cdot 052x + \cdot 025y$
t	+15·82 − 1·02	− 1·02 + 8·11	+ ·259 − ·006	− ·006 + ·206
u	+ 1·46 − ·19	− ·19 + ·03	+ ·024 − ·003	− ·003 + ·001
q	+ 7·40 − 2·07	− 2·07 + ·58	+ ·119 − ·033	− ·043 + ·012
s	+ 2·56 − 1·65	− 1·65 + 1·06	+ ·040 − ·026	− ·039 + ·025
n	+ ·61 + 1·92	+ 1·92 + 6·05	+ ·013 + ·039	+ ·050 + ·157
i	+ 1·69 + ·61	+ ·61 + ·22	+ ·029 + ·010	+ ·018 + ·006
m	+ 7·40 + 2·56	+ 2·56 + ·88	+ ·125 + ·043	+ ·075 + ·026
g	+ 1·80 + ·15	+ ·15 + ·01	+ ·030 + ·002	+ ·006 ·000
h	+ 2·10 ·00	·00 ·00	+ ·035 ·000	+ ·003 ·000
k	+ 3·61 ·00	·00 ·00	+ ·060 ·000	+ ·005 ·000
l	+ 1·25 − ·91	− ·91 + ·66	+ ·019 − ·014	− ·022 + ·016
o	+ 4·37 − 4·33	− 4·33 + 4·28	+ ·066 − ·066	− ·105 + ·103

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To determine q. *Mag.* 8·4.

Pair.		Distances.	Weight.	v
		"		"
rq	57	$-\ \cdot42x_q - \cdot91y_q = -\ \cdot08$	7·5	·00
tq	6	$-\ 1\cdot00 - \cdot02 - \cdot05$	7·4	+ ·02
wq	124	$-\ 1\cdot00 + \cdot03\ \ \cdot00$	3·4	− ·03
uq	140	$-\ 1\cdot00 + \cdot02 - \cdot11$	4·5	− ·04
vq	99	$-\ \cdot99 + \cdot13 - \cdot17$	7·5	− ·02
sq	56	$-\ \cdot65 + \cdot76 + \cdot03$	7·3	+ ·05
nq	154	$+\ \cdot80 + \cdot60 + \cdot26$	5·4	+ ·05
mq	100	$+\ 1\cdot00 + \cdot06 + \cdot20$	6·2	+ ·09
pq	54	$+\ \cdot96 - \cdot27 + \cdot06$	8·0	·00
oq	5	$+\ \cdot91 - \cdot41 - \cdot15$	3·9	− ·24
		Position-Angles.		
wq	124p	$+\ \cdot03x_q + 1\cdot00y_q = +\ \cdot64$	0·8	+ ·55
mq	100p	$+\ \cdot06 - 1\cdot00 + \cdot35$	0·5	+ ·46
		Meridian Observations.		
		$+\ 1\cdot00x_q + \cdot00y_q = +\ \cdot01$	5·8	− ·04
		$\cdot00 + 1\cdot00 = \cdot00$	14·6	− ·08

Normal Equations.

$$+\ 53\cdot11x_q - 2\cdot34y_q = +\ 4\cdot61 + \mathrm{I}_q$$
$$-\ 2\cdot34 + 29\cdot60 = +\ 1\cdot89 + \mathrm{II}_q$$

Solution. p'

$$x_q = +\ \cdot0899 + \mathrm{III}_q \qquad (52\cdot92)$$
$$y_q = +\ \cdot0710 + \mathrm{IV}_q \qquad (29\cdot50)$$

	I_q	II_q	III_q	IV_q
r	$+\ 1\cdot32x + 2\cdot86y$	$+\ 2\cdot86x + 6\cdot20y$	$+\ \cdot029x + \cdot063y$	$+\ \cdot099x + \cdot215y$
t	$+\ 7\cdot40 + \cdot14$	$+\ \cdot14\ \ \cdot00$	$+\ \cdot140 + \cdot003$	$+\ \cdot016\ \ \cdot000$
w	$+\ 3\cdot39 - \cdot11$	$-\ \cdot11\ \ \cdot00$	$+\ \cdot064 - \cdot002$	$+\ \cdot001\ \ \cdot000$
u	$+\ 4\cdot49 - \cdot05$	$-\ \cdot05 + \cdot79$	$+\ \cdot085\ \ \cdot000$	$+\ \cdot005 + \cdot027$
v	$+\ 7\cdot34 - \cdot98$	$-\ \cdot98 + \cdot13$	$+\ \cdot137 - \cdot018$	$-\ \cdot022 + \cdot003$
s	$+\ 3\cdot10 - 3\cdot61$	$-\ 3\cdot61 + 4\cdot20$	$+\ \cdot053 - \cdot062$	$-\ \cdot118 + \cdot137$
n	$+\ 3\cdot46 + 2\cdot59$	$+\ 2\cdot59 + 1\cdot93$	$+\ \cdot069 + \cdot052$	$+\ \cdot093 + \cdot069$
m	$+\ 6\cdot20 + \cdot34$	$+\ \cdot34 + \cdot52$	$+\ \cdot118 + \cdot007$	$+\ \cdot021 + \cdot018$
p	$+\ 7\cdot40 - 2\cdot07$	$-\ 2\cdot07 + \cdot58$	$+\ \cdot137 - \cdot038$	$-\ \cdot059 + \cdot017$
o	$+\ 3\cdot20 - 1\cdot45$	$-\ 1\cdot45 + \cdot66$	$+\ \cdot058 - \cdot026$	$-\ \cdot044 + \cdot020$

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To determine Star r. *Mag.* 7·9.

Pair.		Distances.	Weight.	v
		″		″
wr	42	$-\ \cdot 87x_r + \cdot 50y_r = +\ \cdot 02$	2·8	$+\ \cdot 08$
vr	119	$-\ \cdot 69 + \cdot 73 -\ \cdot 17$	3·6	$+\ \cdot 01$
ur	137	$-\ \cdot 62 + \cdot 79 -\ \cdot 21$	3·5	$-\ \cdot 05$
tr	11	$-\ \cdot 53 + \cdot 85 -\ \cdot 12$	7·4	$-\ \cdot 03$
sr	90	$-\ \cdot 14 + \cdot 99 -\ \cdot 24$	3·5	$-\ \cdot 13$
qr	57	$+\ \cdot 42 + \cdot 91 -\ \cdot 08$	7·5	$\cdot 00$
pr	139	$+\ \cdot 90 + \cdot 44 +\ \cdot 17$	4·7	$+\ \cdot 07$
or	41	$+\ \cdot 97 + \cdot 23 +\ \cdot 32$	2·9	$+\ \cdot 08$
		Meridian Observations.		
		$+\ 1\cdot 00x_r + \cdot 00y_r = \cdot 00$	4·0	$-\ \cdot 13$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	10·0	$+\ \cdot 04$

Normal Equations.

$$+\ 19\cdot 15x_r - 3\cdot 22y_r = +\ 2\cdot 79 + \mathrm{I}_r$$
$$-\ 3\cdot 22 + 30\cdot 83 = -\ 2\cdot 57 + \mathrm{II}_r$$

Solution. p'

$$x_r = +\ \cdot 1340 + \mathrm{III}_r \qquad (18\cdot 81)$$
$$y_r = -\ \cdot 0694 + \mathrm{IV}_r \qquad (30\cdot 29)$$

	I_r	II_r	III_r	IV_r
w	$+\ 2\cdot 10x - 1\cdot 22y$	$-\ 1\cdot 22x + \cdot 71y$	$+\ \cdot 105x - \cdot 061y$	$-\ \cdot 029x + \cdot 017y$
v	$+\ 1\cdot 72 - 1\cdot 82$	$-\ 1\cdot 82 + 1\cdot 93$	$+\ \cdot 081 - \cdot 086$	$-\ \cdot 050 + \cdot 054$
u	$+\ 1\cdot 35 - 1\cdot 72$	$-\ 1\cdot 72 + 2\cdot 19$	$+\ \cdot 062 - \cdot 079$	$-\ \cdot 049 + \cdot 063$
t	$+\ 2\cdot 07 - 3\cdot 33$	$-\ 3\cdot 33 + 5\cdot 34$	$+\ \cdot 092 - \cdot 147$	$-\ \cdot 098 + \cdot 158$
s	$+\ \cdot 07 - \cdot 48$	$-\ \cdot 48 + 3\cdot 42$	$+\ \cdot 001 - \cdot 007$	$-\ \cdot 015 + \cdot 110$
q	$+\ 1\cdot 32 + 2\cdot 86$	$+\ 2\cdot 86 + 6\cdot 20$	$+\ \cdot 086 + \cdot 186$	$+\ \cdot 102 + \cdot 221$
p	$+\ 3\cdot 80 + 1\cdot 85$	$+\ 1\cdot 85 + \cdot 90$	$+\ \cdot 212 + \cdot 103$	$+\ \cdot 082 + \cdot 040$
o	$+\ 2\cdot 72 + \cdot 64$	$+\ \cdot 64 + \cdot 15$	$+\ \cdot 148 + \cdot 035$	$+\ \cdot 036 + \cdot 008$

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To determine Star s. *Mag.* 7·9.

Pair.		Distances.	Weight.	v
		″		″
ts	63	$-\ \cdot 37x_s - \cdot 93y_s = -\ \cdot 07$	8·0	$-\ \cdot 01$
us	118	$-\ \cdot 55 - \cdot 84 + \cdot 02$	5·5	$+\ \cdot 02$
vs	89	$-\ \cdot 82 - \cdot 57 - \cdot 27$	5·4	$-\ \cdot 17$
ws	40	$-\ \cdot 91 - \cdot 42 + \cdot 35$	3·7	$+\ \cdot 27$
xs	21	$-\ \cdot 99 - \cdot 11 + \cdot 16$	2·9	$+\ \cdot 10$
Fs	37	$-\ \cdot 87 + \cdot 49 - \cdot 07$	6·6	$-\ \cdot 01$
ns	39	$+\ \cdot 99 + \cdot 11 + \cdot 20$	3·9	$+\ \cdot 09$
ps	3	$+\ \cdot 84 - \cdot 54 - \cdot 10$	3·6	$-\ \cdot 09$
qs	56	$+\ \cdot 65 - \cdot 76 + \cdot 03$	7·3	$+\ \cdot 05$
rs	90	$+\ \cdot 14 - \cdot 99 - \cdot 24$	3·5	$-\ \cdot 13$
		Meridian Observations.		
		$+\ 1\cdot 00x_s + \cdot 00y_s = \cdot 00$	3·7	$+\ \cdot 03$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	9·3	$-\ \cdot 04$

Normal Equations.	*Solution.*	p'
$+\ 30\cdot 49x_s + 1\cdot 40y_s = +\ 0\cdot 59 + \mathrm{I}_s$	$x_s = +\ \cdot 0174 + \mathrm{III}_s$	(30·43)
$+\ 1\cdot 40 + 32\cdot 90 = +\ 1\cdot 39 + \mathrm{II}_s$	$y_s = +\ \cdot 0415 + \mathrm{IV}_s$	(32·84)

	I_s	II_s	III_s	IV_s
t	$+\ 1\cdot 10x + 2\cdot 76y$	$+\ 2\cdot 76x + 6\cdot 92y$	$+\ \cdot 032x + \cdot 081y$	$+\ \cdot 083x + \cdot 207y$
u	$+\ 1\cdot 66 + 2\cdot 54$	$+\ 2\cdot 54 + 3\cdot 88$	$+\ \cdot 051 + \cdot 078$	$+\ \cdot 075 + \cdot 115$
v	$+\ 3\cdot 61 + 2\cdot 51$	$+\ 2\cdot 51 + 1\cdot 74$	$+\ \cdot 115 + \cdot 080$	$+\ \cdot 071 + \cdot 049$
w	$+\ 3\cdot 06 + 1\cdot 42$	$+\ 1\cdot 42 + \cdot 66$	$+\ \cdot 099 + \cdot 046$	$+\ \cdot 039 + \cdot 018$
x	$+\ 2\cdot 82 + \cdot 32$	$+\ \cdot 32 + \cdot 04$	$+\ \cdot 092 + \cdot 010$	$+\ \cdot 006 + \cdot 001$
F	$+\ 5\cdot 02 - 2\cdot 82$	$-\ 2\cdot 82 + 1\cdot 59$	$+\ \cdot 169 - \cdot 095$	$-\ \cdot 093 + \cdot 052$
n	$+\ 3\cdot 80 + \cdot 43$	$+\ \cdot 43 + \cdot 05$	$+\ \cdot 124 + \cdot 014$	$+\ \cdot 008 + \cdot 001$
p	$+\ 2\cdot 56 - 1\cdot 65$	$-\ 1\cdot 65 + 1\cdot 06$	$+\ \cdot 086 - \cdot 056$	$-\ \cdot 054 + \cdot 035$
q	$+\ 3\cdot 10 - 3\cdot 63$	$-\ 3\cdot 63 + 4\cdot 24$	$+\ \cdot 107 - \cdot 125$	$-\ \cdot 115 + \cdot 134$
r	$+\ \cdot 07 - \cdot 48$	$-\ \cdot 48 + 3\cdot 42$	$+\ \cdot 003 - \cdot 021$	$-\ \cdot 015 + \cdot 105$

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To determine Star t. *Mag.* 7·9.

Pair.		Distances.	Weight.	v
wt	127	$-1{\cdot}00x_t + {\cdot}08y_t = +{\cdot}03$	3·0	$-{\cdot}06$
ut	143	$-{\cdot}98 + {\cdot}21 + {\cdot}02$	11·1	$+{\cdot}05$
vt	62	$-{\cdot}92 + {\cdot}40 - {\cdot}03$	8·2	$+{\cdot}06$
xt	104	$-{\cdot}92 + {\cdot}39 + {\cdot}05$	3·8	$+{\cdot}01$
Ft	12	$-{\cdot}58 + {\cdot}81 - {\cdot}26$	3·3	·00
st	63	$+{\cdot}37 + {\cdot}93 - {\cdot}07$	8·0	$-{\cdot}01$
qt	6	$+1{\cdot}00 + {\cdot}02 - {\cdot}05$	7·4	$+{\cdot}02$
pt	123	$+{\cdot}99 - {\cdot}13 + {\cdot}09$	16·0	$+{\cdot}07$
rt	11	$+{\cdot}53 - {\cdot}85 - {\cdot}12$	7·4	$-{\cdot}03$
		Position-Angles.		
pt	123p	$-{\cdot}13x_t - {\cdot}99y_t = +{\cdot}15$	8·0	$+{\cdot}09$
		Meridian Observations.		
		$+1{\cdot}00x_t + {\cdot}00y_t = {\cdot}00$	7·0	$+{\cdot}01$
		·00 $+1{\cdot}00 = {\cdot}00$	17·2	$+{\cdot}03$

Normal Equations.	*Solution.*	p'
$+58{\cdot}27x_t - 9{\cdot}90y_t = +0{\cdot}45 + \mathrm{I}_t$	$x_t = +{\cdot}0004 + \mathrm{III}_t$	(55·95)
$-9{\cdot}90 + 42{\cdot}17 = -1{\cdot}82 + \mathrm{II}_t$	$y_t = -{\cdot}0430 + \mathrm{IV}_t$	(40·49)

	I_t	II_t	III_t	IV_t
w	$+2{\cdot}99x - {\cdot}24y$	$-{\cdot}24x + {\cdot}02y$	$+{\cdot}052x - {\cdot}004y$	$+{\cdot}007x - {\cdot}001y$
u	$+10{\cdot}63 - 2{\cdot}28$	$-2{\cdot}28 + {\cdot}49$	$+{\cdot}180 - {\cdot}039$	$-{\cdot}012 + {\cdot}003$
v	$+6{\cdot}92 - 3{\cdot}00$	$-3{\cdot}00 + 1{\cdot}30$	$+{\cdot}111 - {\cdot}048$	$-{\cdot}045 + {\cdot}020$
x	$+3{\cdot}20 - 1{\cdot}36$	$-1{\cdot}36 + {\cdot}58$	$+{\cdot}052 - {\cdot}022$	$-{\cdot}020 + {\cdot}009$
F	$+1{\cdot}12 - 1{\cdot}57$	$-1{\cdot}57 + 2{\cdot}19$	$+{\cdot}013 - {\cdot}019$	$-{\cdot}034 + {\cdot}048$
s	$+1{\cdot}10 + 2{\cdot}76$	$+2{\cdot}76 + 6{\cdot}92$	$+{\cdot}031 + {\cdot}078$	$+{\cdot}073 + {\cdot}183$
q	$+7{\cdot}40 + {\cdot}14$	$+{\cdot}14$ ·00	$+{\cdot}133 + {\cdot}003$	$+{\cdot}035 + {\cdot}001$
p	$+15{\cdot}82 - 1{\cdot}02$	$-1{\cdot}02 + 8{\cdot}11$	$+{\cdot}279 + {\cdot}016$	$+{\cdot}041 + {\cdot}196$
r	$+2{\cdot}07 - 3{\cdot}33$	$-3{\cdot}33 + 5{\cdot}34$	$+{\cdot}023 - {\cdot}037$	$-{\cdot}074 + {\cdot}118$

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To determine Star u. *Mag.* 8·0.

Pair.		Distances.	Weight.	v
		″		″
wu	120	$-1{\cdot}00x_u + {\cdot}06y_u = +{\cdot}13$	4·2	+ ·03
yu	160	$-1{\cdot}00 + {\cdot}09 - {\cdot}15$	1·8	− ·04
xu	146	$-{\cdot}91 + {\cdot}41 + {\cdot}12$	4·1	+ ·04
vu	94	$-{\cdot}87 + {\cdot}49 - {\cdot}02$	9·3	+ ·02
Fu	163	$-{\cdot}53 + {\cdot}85 - {\cdot}11$	2·8	+ ·10
su	118	$+{\cdot}55 + {\cdot}84 + {\cdot}02$	5·5	+ ·02
qu	140	$+1{\cdot}00 - {\cdot}02 - {\cdot}11$	4·5	− ·04
pu	97	$+{\cdot}99 - {\cdot}13 + {\cdot}01$	1·5	+ ·01
tu	143	$+{\cdot}98 - {\cdot}21 + {\cdot}02$	11·1	+ ·05
ru	137	$+{\cdot}62 - {\cdot}79 - {\cdot}21$	3·5	− ·05
		Meridian Observations.		
		$+1{\cdot}00x_u + {\cdot}00y_u = {\cdot}00$	3·7	+ ·02
		${\cdot}00 + 1{\cdot}00 = {\cdot}00$	9·6	− ·05

Normal Equations.	*Solution.*	p'
$+40{\cdot}51x_u - 8{\cdot}89y_u = -1{\cdot}04 + \mathrm{I}_u$	$x_u = -{\cdot}0226 + \mathrm{III}_u$	(36·77)
$-8{\cdot}89 + 21{\cdot}15 = +{\cdot}50 + \mathrm{II}_u$	$y_u = +{\cdot}0142 + \mathrm{IV}_u$	(19·20)

	I_u	II_u	III_u	IV_u
w	$+4{\cdot}20x - {\cdot}25y$	$-{\cdot}25x + {\cdot}01y$	$+{\cdot}111x - {\cdot}007y$	$+{\cdot}035x - {\cdot}002y$
y	$+1{\cdot}80 - {\cdot}16$	$-{\cdot}16 + {\cdot}01$	$+{\cdot}047 - {\cdot}004$	$+{\cdot}012 - {\cdot}001$
x	$+3{\cdot}39 - 1{\cdot}53$	$-1{\cdot}53 + {\cdot}69$	$+{\cdot}075 - {\cdot}034$	$-{\cdot}041 + {\cdot}018$
v	$+7{\cdot}02 - 3{\cdot}95$	$-3{\cdot}95 + 2{\cdot}22$	$+{\cdot}146 - {\cdot}082$	$-{\cdot}126 + {\cdot}071$
F	$+{\cdot}79 - 1{\cdot}26$	$-1{\cdot}26 + 2{\cdot}02$	$+{\cdot}007 - {\cdot}011$	$-{\cdot}057 + {\cdot}091$
s	$+1{\cdot}66 + 2{\cdot}54$	$+2{\cdot}54 + 3{\cdot}88$	$+{\cdot}074 + {\cdot}113$	$+{\cdot}151 + {\cdot}231$
q	$+4{\cdot}49 - {\cdot}08$	$-{\cdot}08 + {\cdot}00$	$+{\cdot}121 - {\cdot}002$	$+{\cdot}047 - {\cdot}001$
p	$+1{\cdot}49 - {\cdot}20$	$-{\cdot}20 + {\cdot}03$	$+{\cdot}038 - {\cdot}005$	$+{\cdot}007 - {\cdot}001$
t	$+10{\cdot}63 - 2{\cdot}28$	$-2{\cdot}28 + {\cdot}49$	$+{\cdot}263 - {\cdot}056$	$+{\cdot}003 - {\cdot}000$
r	$+1{\cdot}35 - 1{\cdot}72$	$-1{\cdot}72 + 2{\cdot}19$	$+{\cdot}017 - {\cdot}022$	$-{\cdot}074 + {\cdot}094$

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To determine Star v. *Mag.* 6·7.

Pair.		Distances.	Weight.	v
		″		″
wv	46	$-\ \cdot98x_v - \cdot18y_v = +\ \cdot11$	5·1	$-\ \cdot07$
yv	132	$-\ 1\cdot00 \quad \cdot00 \quad +\ \cdot06$	1·9	$+\ \cdot09$
zv	158	$-\ \cdot96 \quad +\ \cdot28 \quad +\ \cdot09$	4·3	$-\ \cdot06$
xv	159	$-\ \cdot92 \quad +\ \cdot39 \quad +\ \cdot17$	5·5	$+\ \cdot03$
Fv	88	$-\ \cdot43 \quad +\ \cdot90 \quad -\ \cdot12$	3·9	$+\ \cdot14$
sv	89	$+\ \cdot82 \quad +\ \cdot57 \quad -\ \cdot27$	5·4	$-\ \cdot17$
qv	99	$+\ \cdot99 \quad -\ \cdot13 \quad -\ \cdot17$	7·5	$-\ \cdot02$
tv	62	$+\ \cdot92 \quad -\ \cdot40 \quad -\ \cdot03$	8·2	$+\ \cdot06$
uv	94	$+\ \cdot87 \quad -\ \cdot49 \quad -\ \cdot02$	9·3	$+\ \cdot02$
rv	119	$+\ \cdot69 \quad -\ \cdot73 \quad -\ \cdot17$	3·6	$+\ \cdot01$
		Meridian Observations.		
		$+\ 1\cdot00x_v + \cdot00y_v = -\ \cdot05$	4·5	$+\ \cdot06$
		$\cdot00 \quad +\ 1\cdot00 = -\ \cdot00$	10·8	$+\ \cdot02$

Normal Equations.	*Solution.*	p
$+\ 47\cdot23x_v - 10\cdot97y_v = -\ 5\cdot22 + \mathrm{I}_v$	$x_v = -\ \cdot1254 + \mathrm{III}_v$	(41·91)
$-\ 10\cdot97 + 22\cdot63 = -\ 0\cdot07 + \mathrm{II}_v$	$y_v = -\ \cdot0639 + \mathrm{IV}$	(20·08)

	I_v	II_v	III_v	IV_v
w	$+\ 4\cdot88x + \cdot91y$	$+\ \cdot91x + \cdot17y$	$+\ \cdot127x + \cdot024y$	$+\ \cdot102x + \cdot019y$
y	$+\ 1\cdot90 - \cdot00$	$-\ \cdot00 + \cdot00$	$+\ \cdot045 + \cdot000$	$+\ \cdot022 + \cdot000$
z	$+\ 3\cdot96 - 1\cdot15$	$-\ 1\cdot15 + \cdot34$	$+\ \cdot081 - \cdot024$	$-\ \cdot012 + \cdot004$
x	$+\ 4\cdot67 - 1\cdot99$	$-\ 1\cdot99 + \cdot85$	$+\ \cdot088 - \cdot038$	$-\ \cdot045 + \cdot019$
F	$+\ \cdot72 - 1\cdot50$	$-\ 1\cdot50 + 3\cdot13$	$+\ \cdot000 + \cdot000$	$-\ \cdot066 + \cdot139$
s	$+\ 3\cdot61 + 2\cdot51$	$+\ 2\cdot51 + 1\cdot74$	$+\ \cdot115 + \cdot080$	$+\ \cdot167 + \cdot116$
q	$+\ 7\cdot34 - \cdot98$	$-\ \cdot98 + \cdot13$	$+\ \cdot164 - \cdot022$	$+\ \cdot036 - \cdot005$
t	$+\ 0\cdot92 - 3\cdot00$	$-\ 3\cdot00 + 1\cdot30$	$+\ \cdot130 - \cdot057$	$-\ \cdot069 + \cdot031$
u	$+\ 7\cdot02 - 3\cdot95$	$-\ 3\cdot95 + 2\cdot22$	$+\ \cdot122 - \cdot069$	$-\ \cdot116 + \cdot065$
r	$+\ 1\cdot72 - 1\cdot82$	$-\ 1\cdot82 + 1\cdot93$	$+\ \cdot020 - \cdot021$	$-\ \cdot071 + \cdot075$

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To determine Star w. *Mag.* 8·2.

Pair.		Distances.	Weight.	v
		″		″
βw	45	$-\ \cdot 99x_w - \cdot 16y_w = +\ \cdot 06$	2·9	+ ·16
γw	91	− ·99 − ·13 − ·08	2·6	− ·11
yw	112	− ·99 + ·12 − ·29	3·0	− ·07
zw	72	− ·88 + ·48 + ·09	3·3	+ ·12
xw	74	− ·43 + ·90 − ·06	6·7	− ·04
Fw	136	+ ·00 + 1·00 − ·32	3·9	+ ·04
sw	40	+ ·91 + ·42 + ·35	3·7	+ ·27
vw	46	+ ·98 + ·18 + ·11	5·1	− ·07
qw	124	+ 1·00 − ·03 ·00	3·4	− ·03
uw	120	+ 1·00 − ·06 + ·13	4·2	+ ·03
tw	127	+ 1·00 − ·08 + ·03	3·0	− ·06
rw	42	+ ·87 − ·50 + ·02	2·8	+ ·08
		Position-Angles.		
qw	124p	$-\ \cdot 03x_w - 1\cdot 00y_w = +\ \cdot 64$	0·8	+ ·55
		Meridian Observations.		
		$+\ 1\cdot 00x_w + \cdot 00y_w = +\ \cdot 01$	5·6	− ·07
		·00 + 1·00 = ·00	13·8	+ ·01

Normal Equations.	*Solution.*	p'
$+\ 38\cdot 30x_w - 3\cdot 02y_w = +\ 3\cdot 25 + \mathrm{I}_w$	$x_w = +\ \cdot 0810 + \mathrm{III}_w$	(37·95)
$-\ 3\cdot 02 + 26\cdot 34 = -\ 1\cdot 52 + \mathrm{II}_w$	$y_w = -\ \cdot 0484 + \mathrm{IV}_w$	(26·10)

	I_w	II_w	III_w	IV_w
β	$+\ 2\cdot 82x + \cdot 45y$	$+\ \cdot 45x + \cdot 07y$	$+\ \cdot 076x + \cdot 012y$	$+\ \cdot 026x + \cdot 004y$
γ	+ 2·53 + ·33	+ ·33 + ·04	+ ·068 + ·009	+ ·020 + ·003
y	+ 2·92 − ·36	− ·36 + ·04	+ ·076 − ·009	− ·005 + ·001
z	+ 2·56 − 1·39	− 1·39 + ·76	+ ·063 − ·034	− ·046 + ·025
x	+ 1·23 − 2·59	− 2·59 + 5·43	+ ·025 − ·052	− ·096 + ·200
F	·00 ·00	·00 + 3·88	·000 + ·012	·000 + ·149
s	+ 3·06 + 1·42	+ 1·42 + ·66	+ ·085 + ·039	+ ·064 + ·030
v	+ 4·88 + ·91	+ ·91 + ·17	+ ·131 + ·025	+ ·050 + ·009
q	+ 3·39 − ·08	− ·08 + ·79	+ ·089 ·000	+ ·007 + ·030
u	+ 4·20 − ·25	− ·25 + ·01	+ ·110 − ·007	+ ·003 + ·000
t	+ 2·99 − ·24	− ·24 + ·02	+ ·078 − ·006	− ·000 + ·000
r	+ 2·10 − 1·22	− 1·22 + ·71	+ ·052 − ·030	− ·040 + ·024

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To determine Star x. *Mag.* 8·1.

Pair.		Distances.	Weight.	v
		″		″
βx	130	$-\ \cdot84x_x - \cdot54y_x = -\ \cdot19$	2·7	− ·11
yx	25	− ·91 − ·42 − ·04	3·6	+ ·11
γx	109	− ·92 − ·40 + ·02	2·0	− ·04
εx	22	− 1·00 − ·02 ·00	3·4	+ ·09
zx	19	− ·99 + ·16 − ·03	3·8	− ·03
αx	73	− ·60 + ·80 + ·04	2·8	·00
Fx	117	+ ·24 + ·97 − ·45	3·9	− ·09
sx	21	+ ·99 + ·11 + ·16	2·9	+ ·10
tx	104	+ ·92 − ·39 + ·05	3·8	+ ·01
vx	159	+ ·92 − ·39 + ·17	5·5	+ ·03
ux	146	+ ·91 − ·41 + ·12	4·1	+ ·04
wx	74	+ ·43 − ·90 − ·06	6·7	− ·04
		Meridian Observations.		
		$+\ 1{\cdot}00x + \cdot00y = \cdot00$	5·3	− ·04
		$\cdot00 + 1{\cdot}00 = \cdot00$	13·8	+ ·01

Normal Equations.

$$+\ 35{\cdot}51x_x - 4{\cdot}78y_x = +\ 1{\cdot}91 + \mathrm{I}_x$$
$$-\ 4{\cdot}78 + 28{\cdot}64 = -\ 1{\cdot}54 + \mathrm{II}_x$$

Solution. p'

$$x_x = +\ \cdot0476 + \mathrm{III}_x \qquad (34{\cdot}71)$$
$$y_x = -\ \cdot0458 + \mathrm{IV}_x \qquad (28{\cdot}00)$$

	I_x	II_x	III_x	IV_x
β	$+\ 1{\cdot}90x + 1{\cdot}23y$	$+\ 1{\cdot}23x + \cdot79y$	$+\ \cdot061x + \cdot039y$	$+\ \cdot053x + \cdot034y$
y	+ 2·99 + 1·38	+ 1·38 + ·64	+ ·093 + ·043	+ ·064 + ·030
γ	+ 1·69 + ·73	+ ·73 + ·31	+ ·052 + ·023	+ ·034 + ·015
ε	+ 3·39 + ·07	+ ·07 + ·00	+ ·098 + ·002	+ ·019 ·000
z	+ 3·72 − ·60	− ·60 + ·10	+ ·104 − ·017	− ·004 + ·001
α	+ 1·00 − 1·34	− 1·34 + 1·80	+ ·022 − ·030	− ·043 + ·058
F	+ ·22 + ·90	+ ·90 + 3·65	+ ·011 + ·044	+ ·033 + ·135
s	+ 2·82 + ·32	+ ·32 + ·04	+ ·083 + ·009	+ ·025 + ·003
t	+ 3·20 − 1·36	− 1·36 + ·58	+ ·086 − ·036	− ·033 + ·014
v	+ 4·67 − 1·99	− 1·99 + ·85	+ ·125 − ·053	− ·049 + ·021
u	+ 3·39 − 1·53	− 1·53 + ·69	+ ·090 − ·041	− ·038 + ·017
w	+ 1·23 − 2·59	− 2·59 + 5·43	+ ·023 − ·049	− ·087 + ·182

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To determine Star y. *Mag.* 8·1.

Pair.		Distances.	Weight.	v
		″		″
βy	78	$-\ \cdot68x_y - \cdot74y_y = -\ \cdot09$	5·6	$-\ \cdot10$
γy	26	$-\ \cdot92 - \cdot39 + \cdot32$	3·4	$+\ \cdot11$
ηy	169	$-\ 1\cdot00 - \cdot03 + \cdot22$	3·4	$+\ \cdot12$
εy	147	$-\ \cdot97 + \cdot25 + \cdot15$	2·7	$+\ \cdot06$
δy	111	$-\ \cdot53 + \cdot85 - \cdot19$	1·2	$-\ \cdot22$
zy	168	$-\ \cdot30 + \cdot95 + \cdot15$	3·8	$+\ \cdot09$
αy	77	$-\ \cdot13 + \cdot99 + \cdot10$	2·2	$+\ \cdot03$
Fy	151	$+\ \cdot60 + \cdot80 - \cdot72$	2·1	$-\ \cdot33$
xy	25	$+\ \cdot91 + \cdot42 - \cdot04$	3·6	$+\ \cdot11$
vy	132	$+\ 1\cdot00\ \ \cdot00 + \cdot06$	1·9	$+\ \cdot09$
uy	160	$+\ 1\cdot00 - \cdot09 - \cdot15$	1·8	$-\ \cdot04$
wy	112	$+\ \cdot99 - \cdot12 - \cdot29$	3·0	$-\ \cdot07$
		Meridian Observations.		
		$+\ 1\cdot00x_y + \cdot00y_y = \cdot00$	4·9	$+\ \cdot14$
		$\cdot00 + 1\cdot00 = \cdot00$	12·5	$-\ \cdot01$

Normal Equations.	*Solution.*	p'
$+\ 27\cdot35x_y + 3\cdot45y_y = -\ 3\cdot94 + \mathrm{I}_y$	$x_y = -\ \cdot1438 + \mathrm{III}_y$	(26·87)
$+\ 3\cdot45 + 24\cdot78 = -\ \cdot55 + \mathrm{II}_y$	$y_y = -\ \cdot0022 + \mathrm{IV}_y$	(24·35)

	I_y	II_y	III_y	IV_y
β	$+\ 2\cdot59x + 2\cdot82y$	$+\ 2\cdot82x + 3\cdot06y$	$+\ \cdot082x + \cdot089y$	$+\ \cdot102x + \cdot111y$
γ	$+\ 2\cdot86 + 1\cdot22$	$+\ 1\cdot22 + \cdot52$	$+\ \cdot100 + \cdot043$	$+\ \cdot035 + \cdot015$
η	$+\ 3\cdot39 + \cdot11$	$+\ \cdot11\ \ \cdot00$	$+\ \cdot126 + \cdot004$	$-\ \cdot013 - \cdot001$
ε	$+\ 2\cdot53 - \cdot65$	$-\ \cdot65 + \cdot17$	$+\ \cdot098 - \cdot025$	$-\ \cdot040 + \cdot010$
δ	$+\ \cdot34 - \cdot55$	$-\ \cdot55 + \cdot88$	$+\ \cdot015 - \cdot025$	$-\ \cdot024 + \cdot039$
z	$+\ \cdot35 - 1\cdot09$	$-\ 1\cdot09 + 3\cdot42$	$+\ \cdot019 - \cdot058$	$-\ \cdot047 + \cdot146$
α	$+\ \cdot04 - \cdot28$	$-\ \cdot28 + 2\cdot16$	$+\ \cdot003 - \cdot022$	$-\ \cdot012 + \cdot090$
F	$+\ \cdot76 + 1\cdot01$	$+\ 1\cdot01 + 1\cdot35$	$+\ \cdot023 + \cdot031$	$+\ \cdot038 + \cdot050$
x	$+\ 2\cdot99 + 1\cdot38$	$+\ 1\cdot38 + \cdot64$	$+\ \cdot104 + \cdot048$	$+\ \cdot041 + \cdot019$
v	$+\ 1\cdot90\ \ \cdot00$	$\cdot00\ \ \cdot00$	$+\ \cdot071\ \ \cdot000$	$-\ \cdot010\ \ \cdot000$
u	$+\ 1\cdot80 - \cdot16$	$-\ \cdot16 + \cdot01$	$+\ \cdot068 - \cdot006$	$-\ \cdot016 + \cdot001$
w	$+\ 2\cdot92 - \cdot36$	$-\ \cdot36 + \cdot04$	$+\ \cdot111 - \cdot014$	$-\ \cdot030 + \cdot003$

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To determine Star z. Mag. 8·5.

Pair.		Distances.	Weight.	v
		″		″
βz	129	$-\ \cdot17x_z - \cdot99y_z = -\ \cdot09$	3·1	+ ·01
γz	108	− ·64 − ·77 − ·02	2·5	− ·03
ηz	145	− ·92 − ·38 − ·16	2·1	− ·08
εz	20	− ·98 − ·17 − ·04	3·5	+ ·05
δz	107	− ·60 + ·80 − ·08	2·3	·00
αz	71	− ·05 + 1·00 + ·09	3·8	+ ·05
Fz	87	+ ·82 + ·57 − ·08	3·2	+ ·13
xz	19	+ ·99 − ·16 − ·03	3·8	− ·03
vz	158	+ ·96 − ·28 + ·09	4·3	− ·06
wz	72	+ ·88 − ·48 + ·09	3·3	+ ·12
yz	168	+ ·30 − ·95 + ·15	3·8	+ ·09
		Position-Angles.		
αz	71*p*	$+\ 1\cdot00x_z + \cdot05y_z = -\ \cdot16$	2·4	− ·14
		Meridian Observations.		
		$+\ 1\cdot00x_z + \cdot00y_z = +\ \cdot02$	4·5	− ·03
		·00 + 1·00 = ·00	11·7	− ·01

Normal Equations.

$$+\ 26\cdot71x_z - 0\cdot85y_z = +\ 0\cdot78 + \mathrm{I}_z$$
$$-\ 0\cdot85 + 27\cdot58 = -\ 0\cdot27 + \mathrm{II}_z$$

Solution. *p′*

$$x_z = +\ \cdot0289 + \mathrm{III}_z \qquad (26\cdot68)$$
$$y_z = -\ \cdot0089 + \mathrm{IV}_z \qquad (27\cdot55)$$

	I_z	II_z	III_z	IV_z
β	$+\ \cdot09x + \cdot52y$	$+\ \cdot52x + 3\cdot03y$	$+\ \cdot004x + \cdot023y$	$+\ \cdot019x + \cdot111y$
γ	+ 1·02 + 1·23	+ 1·23 + 1·49	+ ·040 + ·048	+ ·046 + ·056
η	+ 1·77 + ·73	+ ·73 + ·30	+ ·067 + ·028	+ ·029 + ·012
ε	+ 3·35 + ·59	+ ·59 + ·10	+ ·126 + ·022	+ ·025 + ·004
δ	+ ·83 − 1·11	− 1·11 + 1·49	+ ·030 − ·040	− ·039 + ·053
α	+ 2·41 − ·08	− ·08 + 3·81	+ ·090 + ·001	·000 + ·138
F	+ 2·16 + 1·50	+ 1·50 + 1·04	+ ·083 + ·057	+ ·057 + ·040
x	+ 3·72 − ·60	− ·60 + ·10	+ ·139 − ·022	− ·018 + ·003
v	+ 3·96 − 1·15	− 1·15 + ·34	+ ·147 − ·043	− ·037 + ·011
w	+ 2·56 − 1·39	− 1·39 + ·76	+ ·094 − ·051	− ·048 + ·026
y	+ ·35 − 1·09	− 1·09 + 3·42	+ ·012 − ·037	− ·039 + ·123

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To determine Star α. *Mag.* 8·0.

Pair.		Distances.	Weight.	v
		″		″
εa	148	$-\ \cdot59x_a - \cdot81y_a = -\ \cdot03$	2·8	$+\ \cdot01$
δa	80	$-\ 1\cdot00 + \cdot04 - \cdot16$	5·2	$-\ \cdot02$
θa	167	$-\ \cdot99 + \cdot14 - \cdot07$	5·7	$+\ \cdot09$
ζa	31	$-\ \cdot66 + \cdot75 + \cdot03$	3·8	$+\ \cdot03$
Fa	38	$+\ \cdot96 - \cdot28 + \cdot17$	7·2	$+\ \cdot05$
xa	73	$+\ \cdot60 - \cdot80 + \cdot04$	2·8	$\cdot00$
ya	77	$+\ \cdot13 - \cdot99 + \cdot10$	2·2	$+\ \cdot03$
za	71	$+\ \cdot05 - 1\cdot00 + \cdot09$	3·8	$+\ \cdot05$
		Position-Angles.		
za	71p	$-\ 1\cdot00x_a - \cdot05y_a = -\ \cdot16$	2·4	$-\ \cdot14$
		Meridian Observations.		
		$+\ 1\cdot00x_a + \cdot00y_a = \cdot00$	3·1	$-\ \cdot08$
		$\cdot00 + 1\cdot00 = \cdot00$	8·4	$+\ \cdot03$

Normal Equations.	*Solution.*	p'
$+\ 26\cdot61x_a - 5\cdot16y_a = +\ 2\cdot88 + \mathrm{I}_a$	$x_a = +\ \cdot1047 + \mathrm{III}_a$	(25·33)
$-\ 5\cdot16 + 20\cdot81 = -\ \cdot92 + \mathrm{II}_a$	$y_a = -\ \cdot0182 + \mathrm{IV}_a$	(19·81)

	I_a	II_a	III_a	IV_a
ε	$+\ \cdot98x + 1\cdot34y$	$+\ 1\cdot34x + 1\cdot82y$	$+\ \cdot052x + \cdot071y$	$+\ \cdot077x + \cdot105y$
δ	$+\ 5\cdot20 - \cdot21$	$-\ \cdot21 + \cdot01$	$+\ \cdot203 - \cdot008$	$+\ \cdot040 - \cdot002$
θ	$+\ 5\cdot62 - \cdot78$	$-\ \cdot78 + \cdot11$	$+\ \cdot214 - \cdot030$	$+\ \cdot016 - \cdot002$
ζ	$+\ 1\cdot66 - 1\cdot88$	$-\ 1\cdot88 + 2\cdot13$	$+\ \cdot047 - \cdot053$	$-\ \cdot079 + \cdot089$
F	$+\ 6\cdot60 - 1\cdot93$	$-\ 1\cdot93 + \cdot56$	$+\ \cdot242 - \cdot071$	$-\ \cdot033 + \cdot009$
x	$+\ 1\cdot00 - 1\cdot34$	$-\ 1\cdot34 + 1\cdot80$	$+\ \cdot026 - \cdot035$	$-\ \cdot058 + \cdot078$
y	$+\ \cdot04 - \cdot28$	$-\ \cdot28 + 2\cdot16$	$-\ \cdot001 + \cdot010$	$-\ \cdot014 + \cdot106$
z	$+\ 2\cdot41 - \cdot08$	$-\ \cdot08 + 3\cdot81$	$+\ \cdot094 + \cdot034$	$+\ \cdot020 + \cdot192$

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To determine Star β. Mag. 8·0.

Pair.		Distances.	Weight.	v
		″		″
γβ	43	$-1{\cdot}00x_\beta - {\cdot}07y_\beta = +{\cdot}13$	5·1	+·01
εβ	82	$-{\cdot}82 + {\cdot}58 - {\cdot}19$	3·0	−·10
zβ	129	$+{\cdot}17 + {\cdot}99 - {\cdot}09$	3·1	+·01
yβ	78	$+{\cdot}68 + {\cdot}74 - {\cdot}09$	5·6	−·10
xβ	130	$+{\cdot}84 + {\cdot}54 - {\cdot}19$	2·7	−·11
wβ	45	$+{\cdot}99 + {\cdot}16 + {\cdot}06$	2·9	+·16
		Meridian Observations.		
		$+1{\cdot}00x_\beta + {\cdot}00y_\beta = {\cdot}00$	3·3	+·01
		${\cdot}00 + 1{\cdot}00 = {\cdot}00$	7·8	+·09

Normal Equations.	*Solution.*	p'
$+17{\cdot}84x_\beta + 3{\cdot}96y_\beta = -{\cdot}84 + \mathrm{I}_\beta$	$x_\beta = -{\cdot}0308 + \mathrm{III}_\beta$	(16·85)
$+3{\cdot}96 + 15{\cdot}76 = -1{\cdot}28 + \mathrm{II}_\beta$	$y_\beta = -{\cdot}0735 + \mathrm{IV}_\beta$	(14·88)

	I_β	II_β	III_β	IV_β
γ	$+5{\cdot}11x + {\cdot}36y$	$+{\cdot}36x + {\cdot}03y$	$+{\cdot}298x + {\cdot}021y$	$-{\cdot}052x - {\cdot}003y$
ε	$+2{\cdot}02 - 1{\cdot}42$	$-1{\cdot}42 + 1{\cdot}00$	$+{\cdot}141 - {\cdot}099$	$-{\cdot}126 + {\cdot}088$
z	$+{\cdot}09 + {\cdot}52$	$+{\cdot}52 + 3{\cdot}03$	$-{\cdot}002 - {\cdot}014$	$+{\cdot}034 + {\cdot}196$
y	$+2{\cdot}59 + 2{\cdot}82$	$+2{\cdot}82 + 3{\cdot}06$	$+{\cdot}112 + {\cdot}122$	$+{\cdot}151 + {\cdot}164$
x	$+1{\cdot}90 + 1{\cdot}23$	$+1{\cdot}23 + {\cdot}79$	$+{\cdot}094 + {\cdot}061$	$+{\cdot}054 + {\cdot}035$
w	$+2{\cdot}82 + {\cdot}45$	$+{\cdot}45 + {\cdot}07$	$+{\cdot}161 + {\cdot}026$	$-{\cdot}012 - {\cdot}002$

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To determine Star γ. Mag. 7·4.

Pair.		Distances.	Weight.	v
		″		″
ηγ	44	$-\ \cdot88x_\gamma + \cdot48y_\gamma = -\ \cdot26$	4·7	− ·10
εγ	29	$-\ \cdot44 + \cdot90 - \cdot16$	2·5	− ·05
zγ	108	$+\ \cdot64 + \cdot77 - \cdot02$	2·5	− ·03
xγ	109	$+\ \cdot92 + \cdot40 + \cdot02$	2·0	− ·04
yγ	26	$+\ \cdot92 + \cdot39 + \cdot32$	3·4	+ ·11
wγ	91	$+\ \cdot99 + \cdot13 - \cdot08$	2·6	− ·11
βγ	43	$+\ 1\cdot00 + \cdot07 + \cdot13$	5·1	+ ·01
		Meridian Observations.		
		$+\ 1\cdot00x_\gamma + \cdot00y_\gamma = -\ \cdot01$	4·2	− ·12
		$\cdot00 + 1\cdot00 = \cdot00$	10·9	+ ·03

Normal Equations.

$$+\ 21\cdot55x_\gamma + 0\cdot90y_\gamma = +\ 2\cdot67 + \mathrm{I}_\gamma$$
$$+\ 0\cdot90 + 16\cdot38 = -\ \cdot52 + \mathrm{II}_\gamma$$

Solution. p'

$$x_\gamma = +\ \cdot1255 + \mathrm{III}_\gamma \qquad (21\cdot50)$$
$$y_\gamma = -\ \cdot0387 + \mathrm{IV}_\gamma \qquad (16\cdot34)$$

	I_γ	II_γ	III_γ	IV_γ
η	$+\ 3\cdot65x - 1\cdot99y$	$-\ 1\cdot99x + 1\cdot08y$	$+\ \cdot175x - \cdot095y$	$-\ \cdot131x + \cdot071y$
ε	$+\ \cdot49 - \cdot99$	$-\ \cdot99 + 2\cdot02$	$+\ \cdot025 - \cdot051$	$-\ \cdot062 + \cdot126$
z	$+\ 1\cdot02 + 1\cdot23$	$+\ 1\cdot23 + 1\cdot49$	$+\ \cdot044 + \cdot053$	$+\ \cdot073 + \cdot088$
x	$+\ 1\cdot69 + \cdot74$	$+\ \cdot74 + \cdot31$	$+\ \cdot077 + \cdot034$	$+\ \cdot041 + \cdot017$
y	$+\ 2\cdot86 + 1\cdot22$	$+\ 1\cdot22 + \cdot52$	$+\ \cdot130 + \cdot055$	$+\ \cdot067 + \cdot029$
w	$+\ 2\cdot53 + \cdot33$	$+\ \cdot33 + \cdot04$	$+\ \cdot117 + \cdot015$	$+\ \cdot014 + \cdot002$
β	$+\ 5\cdot11 + \cdot36$	$+\ \cdot36 + \cdot03$	$+\ \cdot237 + \cdot017$	$+\ \cdot009 + \cdot001$

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To determine Star δ. Mag. 8·3.

Pair.		Distances.	Weight.	v
		″		″
εδ	161	$-\cdot 11x_\delta - \cdot 99y_\delta = -\cdot 11$	5·3	−·10
ηδ	79	$-\cdot 24 - \cdot 97 + \cdot 33$	2·1	+·33
θδ	64	$-\cdot 97 + \cdot 23 - \cdot 03$	5·5	−·01
λδ	105	$-\cdot 94 + \cdot 35 + \cdot 11$	4·6	−·05
ζδ	28	$-\cdot 26 + \cdot 97 + \cdot 21$	2·4	+·09
αδ	80	$+1\cdot 00 - \cdot 04 - \cdot 16$	5·2	−·02
zδ	107	$+\cdot 60 - \cdot 80 - \cdot 08$	2·3	·00
yδ	111	$+\cdot 53 - \cdot 85 - \cdot 19$	1·2	−·22
		Position-Angles.		
εδ	161*p*	$-\cdot 99x_\delta + \cdot 11y_\delta = +\cdot 04$	2·8	+·03
λδ	105*p*	$+\cdot 35 + \cdot 94 - \cdot 04$	1·7	+·02
		Meridian Observations.		
		$+1\cdot 00x_\delta + \cdot 00y_\delta = +\cdot 01$	4·3	+·06
		$\cdot 00 + 1\cdot 00 = \cdot 00$	10·8	−·02

Normal Equations.	*Solution.*	*p′*
$+23\cdot 16x_\delta - 3\cdot 89y_\delta = -1\cdot 71 + \mathrm{I}_\delta$	$x_\delta = -\cdot 0699 + \mathrm{III}_\delta$	(22·56)
$-3\cdot 89 + 25\cdot 01 = +0\cdot 86 + \mathrm{II}_\delta$	$y_\delta = +\cdot 0235 + \mathrm{IV}_\delta$	(24·36)

	I_δ	II_δ	III_δ	IV_δ
ε	$+2\cdot 78x + \cdot 27y$	$+\cdot 27x + 5\cdot 23y$	$+\cdot 125x + \cdot 048y$	$+\cdot 030x + \cdot 217y$
η	$+\cdot 12 + \cdot 49$	$+\cdot 49 + 1\cdot 99$	$+\cdot 009 + \cdot 035$	$+\cdot 021 + \cdot 085$
θ	$+5\cdot 20 - 1\cdot 23$	$-1\cdot 23 + \cdot 29$	$+\cdot 222 - \cdot 053$	$-\cdot 015 + \cdot 003$
λ	$+4\cdot 25 - \cdot 95$	$-\cdot 95 + 2\cdot 05$	$+\cdot 182 - \cdot 028$	$-\cdot 010 + \cdot 078$
ζ	$+\cdot 16 - \cdot 60$	$-\cdot 60 + 2\cdot 25$	$+\cdot 003 - \cdot 011$	$-\cdot 024 + \cdot 088$
α	$+5\cdot 20 - \cdot 21$	$-\cdot 21 + \cdot 01$	$+\cdot 229 - \cdot 009$	$+\cdot 027 - \cdot 001$
z	$+\cdot 83 - 1\cdot 11$	$-1\cdot 11 + 1\cdot 49$	$+\cdot 029 - \cdot 039$	$-\cdot 040 + \cdot 054$
y	$+\cdot 34 - \cdot 55$	$-\cdot 55 + \cdot 88$	$+\cdot 011 - \cdot 018$	$-\cdot 020 + \cdot 032$

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To determine Star ε. Mag. 6·6.

Pair.		Distances.	Weight.	v
		″		″
ηε	133	$-\ \cdot 60x_\varepsilon - \cdot 80y_\varepsilon = -\ \cdot 05$	6·0	$-\ \cdot 07$
ιε	81	$-\ \cdot 89 - \cdot 45 + \cdot 31$	3·1	$+\ \cdot 16$
θε	30	$-\ \cdot 43 + \cdot 90 - \cdot 05$	3·7	$+\ \cdot 03$
δε	161	$+\ \cdot 11 + \cdot 99 - \cdot 11$	5·3	$-\ \cdot 10$
αε	148	$+\ \cdot 59 + \cdot 81 - \cdot 03$	2·8	$+\ \cdot 01$
zε	20	$+\ \cdot 98 + \cdot 17 - \cdot 04$	3·5	$+\ \cdot 05$
xε	22	$+\ 1\cdot 00 + \cdot 02\quad \cdot 00$	3·4	$+\ \cdot 09$
yε	147	$+\ \cdot 97 - \cdot 25 + \cdot 15$	2·7	$+\ \cdot 06$
βε	82	$+\ \cdot 82 - \cdot 58 - \cdot 19$	3·0	$-\ \cdot 10$
γε	29	$+\ \cdot 44 - \cdot 90 - \cdot 16$	2·5	$-\ \cdot 05$
		Position-Angles.		
ιε	81*p*	$-\ \cdot 45x_\varepsilon + \cdot 89y_\varepsilon = +\ \cdot 17$	1·7	$+\ \cdot 09$
δε	161*p*	$+\ \cdot 99 - \cdot 11 + \cdot 04$	2·8	$+\ \cdot 03$
		Meridian Observations.		
		$+\ 1\cdot 00x_\varepsilon + \cdot 00y_\varepsilon = -\ \cdot 05$	3·9	$\cdot 00$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	9·6	$-\ \cdot 01$

Normal Equations.	*Solution.*	p'
$+\ 25\cdot 08x_\varepsilon + 1\cdot 21y_\varepsilon = -\ 1\cdot 30 + \mathrm{I}_\varepsilon$	$x_\varepsilon = -\ \cdot 0516 + \mathrm{III}_\varepsilon$	(25·03)
$+\ 1\cdot 21 + 28\cdot 75 = -\ \cdot 18 + \mathrm{II}_\varepsilon$	$y_\varepsilon = -\ \cdot 0041 + \mathrm{IV}_\varepsilon$	(28·69)

	I_ε	II_ε	III_ε	IV_ε
η	$+\ 2\cdot 16x + 2\cdot 88y$	$+\ 2\cdot 88x + 3\cdot 84y$	$+\ \cdot 081x + \cdot 109y$	$+\ \cdot 097x + \cdot 129y$
ι	$+\ 2\cdot 81 + \cdot 56$	$+\ \cdot 56 + 1\cdot 97$	$+\ \cdot 111 + \cdot 019$	$+\ \cdot 015 + \cdot 068$
θ	$+\ \cdot 69 - 1\cdot 44$	$-\ 1\cdot 44 + 2\cdot 99$	$+\ \cdot 030 - \cdot 063$	$-\ \cdot 051 + \cdot 107$
δ	$+\ 2\cdot 78 + \cdot 27$	$+\ \cdot 27 + 5\cdot 23$	$+\ \cdot 111 + \cdot 002$	$+\ \cdot 005 + \cdot 182$
α	$+\ \cdot 98 + 1\cdot 34$	$+\ 1\cdot 34 + 1\cdot 82$	$+\ \cdot 037 + \cdot 050$	$+\ \cdot 045 + \cdot 061$
z	$+\ 3\cdot 35 + \cdot 59$	$+\ \cdot 59 + \cdot 10$	$+\ \cdot 133 + \cdot 023$	$+\ \cdot 015 + \cdot 003$
x	$+\ 3\cdot 39 + \cdot 07$	$+\ \cdot 07\quad \cdot 00$	$+\ \cdot 135 + \cdot 003$	$-\ \cdot 003\quad \cdot 000$
y	$+\ 2\cdot 53 - \cdot 65$	$-\ \cdot 65 + \cdot 17$	$+\ \cdot 102 - \cdot 026$	$-\ \cdot 027 + \cdot 007$
β	$+\ 2\cdot 02 - 1\cdot 42$	$-\ 1\cdot 42 + 1\cdot 00$	$+\ \cdot 083 - \cdot 058$	$-\ \cdot 053 + \cdot 037$
γ	$+\ \cdot 49 - \cdot 99$	$-\ \cdot 99 + 2\cdot 02$	$+\ \cdot 021 - \cdot 043$	$-\ \cdot 035 + \cdot 072$

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To determine Star ζ. Mag. 8·0.

Pair.		Distances.	Weight.	v
		″		″
θζ	65	$-\ \cdot46x_\zeta - \cdot89y_\zeta = +\ \cdot22$	3·2	+ ·10
λζ	67	$-\ \cdot91 - \cdot43 + \cdot18$	4·6	+ ·05
κζ	32	$-\ \cdot89 + \cdot45 + \cdot01$	5·8	− ·03
αζ	31	$+\ \cdot66 - \cdot75 + \cdot03$	3·8	+ ·03
δζ	28	$+\ \cdot26 - \cdot97 + \cdot21$	2·4	+ ·09
		Position-Angles.		
θζ	65p	$-\ \cdot89x_\zeta + \cdot46y_\zeta = -\ \cdot39$	1·6	− ·22
λζ	67p	$-\ \cdot43 + \cdot91 + \cdot01$	2·2	+ ·05
		Meridian Observations.		
		$+\ 1\cdot00x_\zeta + \cdot00y_\zeta = \cdot00$	3·6	− ·03
		$\cdot00 + 1\cdot00 = \cdot00$	9·0	+ ·09

Normal Equations.	*Solution.*	p
$+\ 16\cdot14x_\zeta - 3\cdot21y_\zeta = -\ \cdot37 + \mathrm{I}_\zeta$	$x_\zeta = -\ \cdot0423 + \mathrm{III}_\zeta$	(15·63)
$-\ 3\cdot21 + 20\cdot09 = -\ 1\cdot82 + \mathrm{II}_\zeta$	$y_\zeta = -\ \cdot0974 + \mathrm{IV}_\zeta$	(19·45)

	I_ζ	II_ζ	III_ζ	IV_ζ
θ	$+\ 1\cdot92x + \cdot65y$	$+\ \cdot65x + 2\cdot87y$	$+\ \cdot130x + \cdot071y$	$+\ \cdot051x + \cdot152y$
λ	$+\ 4\cdot21 + \cdot93$	$+\ \cdot93 + 2\cdot67$	$+\ \cdot279 + \cdot087$	$+\ \cdot086 + \cdot144$
κ	$+\ 4\cdot58 - 2\cdot31$	$-\ 2\cdot31 + 1\cdot17$	$+\ \cdot269 - \cdot136$	$-\ \cdot074 + \cdot038$
α	$+\ 1\cdot66 - 1\cdot88$	$-\ 1\cdot88 + 2\cdot13$	$+\ \cdot087 - \cdot098$	$-\ \cdot080 + \cdot090$
δ	$+\ \cdot16 - \cdot60$	$-\ \cdot60 + 2\cdot25$	$+\ \cdot004 - \cdot015$	$-\ \cdot029 + \cdot109$

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To determine Star η. Mag. 8·1.

Pair.		Distances.	Weight.	v
		″		″
$\theta\eta$	13	$-\ \cdot25x_\eta + \cdot97y_\eta = -\ \cdot18$	2·5	$-\ \cdot11$
$\delta\eta$	79	$+\ \cdot24 + \cdot97 + \cdot33$	2·1	$+\ \cdot33$
$\epsilon\eta$	133	$+\ \cdot60 + \cdot80 - \cdot05$	6·0	$-\ \cdot07$
$z\eta$	145	$+\ \cdot92 + \cdot38 - \cdot16$	2·1	$-\ \cdot08$
$y\eta$	169	$+\ 1\cdot00 + \cdot03 + \cdot22$	3·4	$+\ \cdot12$
$\gamma\eta$	44	$+\ \cdot88 - \cdot48 - \cdot26$	4·7	$-\ \cdot10$
		Meridian Observations.		
		$+\ 1\cdot00x_\eta + \cdot00y_\eta = \cdot00$	3·9	$+\ \cdot04$
		$\cdot00 + 1\cdot00 = \cdot00$	9·4	$-\ \cdot03$

Normal Equations.	*Solution.*	p'
$+\ 15\cdot13x_\eta + 1\cdot60y_\eta = -\ \cdot54 + \mathrm{I}_\eta$	$x_\eta = -\ \cdot0387 + \mathrm{III}_\eta$	(15·00)
$+\ 1\cdot60 + 19\cdot00 = +\ \cdot48 + \mathrm{II}_\eta$	$y_\eta = +\ \cdot0285 + \mathrm{IV}_\eta$	(18·83)

	I_η	II_η	III_η	IV_η
θ	$+\ \cdot16x - \cdot62y$	$-\ \cdot62x + 2\cdot37y$	$+\ \cdot014x - \cdot055y$	$-\ \cdot034x + \cdot129y$
δ	$+\ \cdot12 + \cdot49$	$+\ \cdot49 + 1\cdot99$	$+\ \cdot005 + \cdot021$	$+\ \cdot025 + \cdot103$
ϵ	$+\ 2\cdot16 + 2\cdot88$	$+\ 2\cdot88 + 3\cdot84$	$+\ \cdot128 + \cdot171$	$+\ \cdot141 + \cdot188$
z	$+\ 1\cdot77 + \cdot73$	$+\ \cdot73 + \cdot30$	$+\ \cdot114 + \cdot047$	$+\ \cdot029 + \cdot012$
y	$+\ 3\cdot39 + \cdot11$	$+\ \cdot11\ \ \cdot00$	$+\ \cdot225 + \cdot007$	$-\ \cdot013 - \cdot001$
γ	$+\ 3\cdot65 - 1\cdot99$	$-\ 1\cdot99 + 1\cdot08$	$+\ \cdot255 - \cdot139$	$-\ \cdot126 + \cdot069$

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To determine Star θ. Mag. 8·4.

Pair.		Distances.	Weight.	v
		″		″
λθ	15	$-\ \cdot 88x_\theta + \cdot 47y_\theta = +\ \cdot 23$	5·1	+ ·04
κθ	14	$-\ \cdot 25 + \cdot 97 + \cdot 31$	3·0	+ ·12
ζθ	65	$+\ \cdot 46 + \cdot 89 + \cdot 22$	3·2	+ ·10
αθ	167	$+\ \cdot 99 - \cdot 14 - \cdot 07$	5·7	+ ·09
δθ	64	$+\ \cdot 97 - \cdot 23 - \cdot 03$	5·5	− ·01
εθ	30	$+\ \cdot 43 - \cdot 90 - \cdot 06$	3·7	+ ·03
ηθ	13	$+\ \cdot 25 - \cdot 97 - \cdot 18$	2·5	− ·11
		Position-Angles.		
λθ	15	$+\ \cdot 47x_\theta + \cdot 88y_\theta = -\ \cdot 05$	1·9	− ·03
κθ	14	$+\ \cdot 97 + \cdot 25 - \cdot 27$	1·6	− ·17
ζθ	65	$+\ \cdot 89 - \cdot 46 - \cdot 39$	1·6	− ·22
		Meridian Observations.		
		$+\ 1\cdot 00x_\theta + \cdot 00y_\theta = +\ \cdot 01$	4·1	+ ·07
		$\cdot 00 + 1\cdot 00 = \cdot 00$	10·1	− ·09

Normal Equations.	*Solution.*	p'
$+\ 23\cdot 72x_\theta - 5\cdot 06y_\theta = -\ 2\cdot 68 + \mathrm{I}_\theta$	$x_\theta = -\ \cdot 0915 + \mathrm{III}_\theta$	(22·66)
$-\ 5\cdot 06 + 24\cdot 21 = +\ 2\cdot 90 + \mathrm{II}_\theta$	$y_\theta = +\ \cdot 1007 + \mathrm{IV}_\theta$	(23·13)

	I_θ	II_θ	III_θ	IV_θ
λ	$+\ 4\cdot 38x - 1\cdot 32y$	$-\ 1\cdot 32x + 2\cdot 58y$	$+\ \cdot 181x - \cdot 034y$	$-\ \cdot 017x + \cdot 099y$
κ	$+\ 1\cdot 67 - \cdot 33$	$-\ \cdot 33 + 2\cdot 92$	$+\ \cdot 071 + \cdot 012$	$+\ \cdot 001 + \cdot 123$
ζ	$+\ 1\cdot 92 + \cdot 65$	$+\ \cdot 65 + 2\cdot 87$	$+\ \cdot 091 + \cdot 055$	$+\ \cdot 046 + \cdot 130$
α	$+\ 5\cdot 62 - \cdot 78$	$-\ \cdot 78 + \cdot 11$	$+\ \cdot 241 - \cdot 033$	$+\ \cdot 018 - \cdot 002$
δ	$+\ 5\cdot 20 - 1\cdot 23$	$-\ 1\cdot 23 + \cdot 29$	$+\ \cdot 218 - \cdot 052$	$-\ \cdot 005 + \cdot 001$
ε	$+\ \cdot 69 - 1\cdot 44$	$-\ 1\cdot 44 + 2\cdot 99$	$+\ \cdot 017 - \cdot 036$	$-\ \cdot 056 + \cdot 116$
η	$+\ \cdot 16 - \cdot 61$	$-\ \cdot 61 + 2\cdot 34$	$+\ \cdot 001 - \cdot 005$	$-\ \cdot 025 + \cdot 096$

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To determine Star ι. Mag. 7·0.

Pair.		Distances.	Weight.	v
ει	81	$+ \cdot 89x_\iota + \cdot 45y_\iota = + \cdot 31''$	3·1	$+ \cdot 16''$
		Position-Angles.		
ει	81p	$+ \cdot 45x_\iota - \cdot 89y_\iota = + \cdot 17$	1·7	$+ \cdot 09$
		Meridian Observations.		
		$+ 1 \cdot 00x_\iota + \cdot 00y_\iota = - \cdot 04$	3·3	$- \cdot 16$
		$\cdot 00 + 1 \cdot 00 = \cdot 00$	8·5	$- \cdot 01$

Normal Equations.

$$+ 6 \cdot 12x_\iota + \cdot 56y_\iota = + \cdot 86 + \mathrm{I}_\iota$$
$$+ \cdot 56 + 10 \cdot 50 = + \cdot 17 + \mathrm{II}_\iota$$

Solution.

$$x_\iota = + \cdot 1397 + \mathrm{III}_\iota \qquad (6 \cdot 09)$$
$$y_\iota = + \cdot 0087 + \mathrm{IV}_\iota \qquad (10 \cdot 45)$$

	I_ι	II_ι	III_ι	IV_ι
ε	$+ 2 \cdot 81x + \cdot 56y$	$+ \cdot 56x + 1 \cdot 97y$	$+ \cdot 456x + \cdot 075y$	$+ \cdot 029x + \cdot 184y$

To determine Star κ. Mag. 7·5.

Pair.		Distances.	Weight.	v
λκ	16	$- \cdot 34x_\kappa - \cdot 94y_\kappa = + \cdot 16''$	6·8	$+ \cdot 07''$
μκ	70	$- \cdot 83 + \cdot 55 - \cdot 18$	8·5	$- \cdot 01$
ζκ	32	$+ \cdot 89 - \cdot 45 + \cdot 01$	5·8	$- \cdot 03$
θκ	14	$+ \cdot 25 - \cdot 97 + \cdot 31$	3·0	$+ \cdot 12$
		Position-Angles		
λκ	16p	$- \cdot 94x_\kappa + \cdot 34y_\kappa = + \cdot 16$	0·9	$+ \cdot 14$
μκ	70p	$+ \cdot 55 + \cdot 83 + \cdot 08$	3·1	$+ \cdot 07$
θκ	14p	$- \cdot 97 - \cdot 25 - \cdot 27$	1·6	$- \cdot 17$
		Meridian Observations.		
		$+ 1 \cdot 00x_\kappa + \cdot 00y_\kappa = - \cdot 02$	3·1	$- \cdot 08$
		$\cdot 00 + 1 \cdot 00 = \cdot 00$	8·2	$+ \cdot 07$

Normal Equations.

$$+ 17 \cdot 71x_\kappa - 3 \cdot 22y_\kappa = + 1 \cdot 53 + \mathrm{I}_\kappa$$
$$- 3 \cdot 22 + 23 \cdot 09 = - 2 \cdot 45 + \mathrm{II}_\kappa$$

Solution.

$$x_\kappa = + \cdot 0688 + \mathrm{III}_\kappa \qquad (17 \cdot 26)$$
$$y_\kappa = - \cdot 0965 + \mathrm{IV}_\kappa \qquad (22 \cdot 50)$$

	I_κ	II_κ	III_κ	IV_κ
λ	$+ 1 \cdot 56x + 1 \cdot 90y$	$+ 1 \cdot 90x + 6 \cdot 10y$	$+ \cdot 106x + \cdot 159y$	$+ \cdot 097x + \cdot 286y$
μ	$+ 6 \cdot 80 - 2 \cdot 48$	$- 2 \cdot 48 + 4 \cdot 72$	$+ \cdot 374 - \cdot 105$	$- \cdot 055 + \cdot 190$
ζ	$+ 4 \cdot 58 - 2 \cdot 31$	$- 2 \cdot 31 + 1 \cdot 17$	$+ \cdot 247 - \cdot 124$	$- \cdot 066 + \cdot 033$
θ	$+ 1 \cdot 67 - \cdot 33$	$- \cdot 33 + 2 \cdot 92$	$+ \cdot 094 + \cdot 004$	$- \cdot 001 + \cdot 127$

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To determine Star λ. *Mag.* 8·1.

Pair.		Distances.	Weight.	v
		″		″
μλ	66	$-\ \cdot 31x_\lambda + \cdot 95y_\lambda = -\ \cdot 12$	4·7	$-\ \cdot 05$
κλ	16	$+\ \cdot 34 + \cdot 94 + \cdot 16$	6·8	$+\ \cdot 07$
ζλ	67	$+\ \cdot 90 + \cdot 43 + \cdot 18$	4·6	$+\ \cdot 05$
δλ	105	$+\ \cdot 94 - \cdot 35 + \cdot 11$	4·6	$-\ \cdot 05$
θλ	15	$+\ \cdot 88 - \cdot 47 + \cdot 23$	5·1	$+\ \cdot 04$
		Position-Angles.		
μλ	66*p*	$+\ \cdot 95x_\lambda + \cdot 31y_\lambda = +\ \cdot 06$	2·5	$-\ \cdot 12$
κλ	16*p*	$+\ \cdot 94 - \cdot 34 + \cdot 16$	0·9	$+\ \cdot 14$
ζλ	67*p*	$+\ \cdot 43 - \cdot 90 + \cdot 01$	2·2	$+\ \cdot 05$
δλ	105*p*	$-\ \cdot 35 - \cdot 94 - \cdot 04$	1·7	$+\ \cdot 02$
θλ	15*p*	$-\ \cdot 47 - \cdot 88 - \cdot 05$	1·9	$-\ \cdot 03$
		Meridian Observations.		
		$+\ 1\cdot 00x_\lambda + \cdot 00y_\lambda = \cdot 00$	3·0	$-\ \cdot 11$
		$\cdot 00 + 1\cdot 00 = \cdot 00$	6·2	$-\ \cdot 01$

Normal Equations.

$$+20\cdot 03x_\lambda - \cdot 08y_\lambda = +\ 3\cdot 15 + \mathrm{I}_\lambda$$
$$-\ \cdot 08 + 24\cdot 03 = +\ \cdot 24 + \mathrm{II}_\lambda$$

Solution. p'

$$x_\lambda = +\ \cdot 1573 + \mathrm{III}_\lambda \qquad (20\cdot 03)$$
$$y_\lambda = +\ \cdot 0105 + \mathrm{IV}_\lambda \qquad (24\cdot 03)$$

	I_λ	II_λ	III_λ	IV_λ
μ	$+\ 2\cdot 70x - \cdot 64y$	$-\ \cdot 64x + 4\cdot 48y$	$+\ \cdot 135x - \cdot 031y$	$-\ \cdot 026x + \cdot 186y$
κ	$+\ 1\cdot 58 + 1\cdot 90$	$+\ 1\cdot 90 + 6\cdot 10$	$+\ \cdot 079 + \cdot 096$	$+\ \cdot 079 + \cdot 254$
ζ	$+\ 4\cdot 13 + \cdot 93$	$+\ \cdot 93 + 2\cdot 62$	$+\ \cdot 206 + \cdot 047$	$+\ \cdot 039 + \cdot 109$
δ	$+\ 4\cdot 25 - \cdot 95$	$-\ \cdot 95 + 2\cdot 05$	$+\ \cdot 212 - \cdot 047$	$-\ \cdot 039 + \cdot 085$
θ	$+\ 4\cdot 38 - 1\cdot 32$	$-\ 1\cdot 32 + 2\cdot 58$	$+\ \cdot 218 - \cdot 065$	$-\ \cdot 054 + \cdot 107$

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To determine Star μ. Mag. 6·5.

Pair.		Distances.	Weight.	v
		″		″
$\kappa\mu$	70	$+ \cdot 83x_\mu - \cdot 55y_\mu = - \cdot 18$	8·5	$- \cdot 01$
$\lambda\mu$	66	$+ \cdot 31 \quad - \cdot 95 \quad - \cdot 12$	4·7	$- \cdot 05$
		Position-Angles.		
$\kappa\mu$	70_p	$- \cdot 55x_\mu - \cdot 83y_\mu = + \cdot 08$	3·1	$+ \cdot 07$
$\lambda\mu$	66_p	$- \cdot 95 \quad - \cdot 31 \quad + \cdot 06$	2·5	$- \cdot 12$
		Meridian Observations.		
		$+ 1 \cdot 00x_\mu + \cdot 00y_\mu = - \cdot 05$	6·0	$+ \cdot 01$
		$\cdot 00 \quad + 1 \cdot 00 \quad = \cdot 00$	15·2	$- \cdot 02$

Normal Equations.

$$+15 \cdot 50x_\mu - 3 \cdot 12y_\mu = - 2 \cdot 02 + \mathrm{I}_\mu$$
$$- 3 \cdot 12 \quad + 24 \cdot 41 = + 1 \cdot 15 + \mathrm{II}_\mu$$

Solution.

$$x_\mu = - \cdot 1240 + \mathrm{III}_\mu \qquad (15 \cdot 10)$$
$$y_\mu = + \cdot 0312 + \mathrm{IV}_\mu \qquad (23 \cdot 78)$$

	I_μ	II_μ	III_μ	IV_μ
κ	$+ 6 \cdot 80x - 2 \cdot 48y$	$- 2 \cdot 48x + 4 \cdot 72y$	$+ \cdot 429x - \cdot 124y$	$- \cdot 047x + \cdot 177y$
λ	$+ 2 \cdot 70 \quad - \cdot 64$	$- \cdot 64 \quad + 4 \cdot 48$	$+ \cdot 173 \quad - \cdot 005$	$- \cdot 004 \quad + \cdot 183$

In the formation of the preceding normal equations all the usual methods of control have been employed to secure perfect accuracy, and the values of x and y in terms of the corrections III. and IV. have been checked by substitution in the original normals.

Since the adopted co-ordinates of the auxiliary stars E and F were only determined by four meridian observations at one observatory, their corrections x_E, y_E, x_F and y_F were probably large as compared with the corresponding corrections of the co-ordinates of the other stars in the triangulation, whose places depend on meridian observations at 22 different observatories. The first step, therefore, was to substitute the preliminary numerical values

$$x_E = + \cdot 1745'' \qquad x_F = + \cdot 0580''$$
$$y_E = + \cdot 5494 \qquad y_F = + \cdot 3389$$

(found at pp. 184 and 185 respectively) in all the equations in which they occur.

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In this way the first approximation to the most probable values of x_a, y_a, x_b, y_b, &c., was obtained for all the stars in the triangulation, as given in column I. of the following Table XVI. These numerical values of x_a, y_a, x_b, y_b, &c. (limited to three decimal places) were then very easily substituted, by the aid of Crelle's Tables, in all the expressions for the corrections III. and IV., and thus new and more approximate values of x_a, y_a, x_b, y_b, &c. (and including x_E, y_E, x_F, and y_F), were obtained.

With the new values of x_a, y_a, x_b, y_b, &c., of the second approximation a third approximation was made, and with the values of the third approximation a fourth approximation. The resulting values of this last approximation differed so slightly from those of the third that it appeared unnecessary to push the approximation further. Accordingly the values of the fourth approximation were substituted in the original normals, and found to satisfy them with all requisite accuracy. For such accuracy it is by no means necessary to satisfy all the normals to ± 0″·01. *Our problem is definitively solved for all practical purposes if in the determination of the co-ordinates in x, the residuals in all the normals in x, when divided by the corresponding weights of x, are insignificant quantities, and similarly with respect to the co-ordinates and normals in y.* (0″·005 has been regarded as an insignificant quantity). From the residuals in this substitution a fifth approximation was obtained. The resulting definitive values will be found in column III. of the following Table XVI.

Having regard to the equivalents of the symbolical terms which enter into both sides of each equation, the substitution of these definitive values in the original equations gives the corresponding residuals which appear in column *v*.

TABLE XVI.

VALUES OF x AND y RESULTING FROM THE TRIANGULATION.

I. First Approximation.			II. Fourth Approximation.			III. Final Approximation.		
	x	y		x	y		x	y
a	+ 0″·055	− 0″·065	a	+ 0″·079	− 0″·020	a	+ 0″·078	− 0″·019
b	− ·106	+ ·078	b	− ·061	+ ·077	b	− ·059	+ ·075
c	+ ·024	+ ·030	c	+ ·050	+ ·034	c	+ ·048	+ ·034
d	+ ·073	− ·028	d	+ ·096	− ·023	d	+ ·094	− ·025
e	− ·020	− ·026	e	+ ·003	− ·020	e	·000	− ·021
f	+ ·120	·000	f	+ ·104	+ ·011	f	+ ·098	+ ·011
g	− ·089	+ ·032	g	− ·090	+ ·047	g	− ·095	+ ·047
h	+ ·018	+ ·019	h	+ ·018	+ ·033	h	+ ·014	+ ·034
i	+ ·027	− ·012	i	+ ·011	+ ·004	i	+ ·010	+ ·004

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TABLE XVI.—*continued.*

I. First Approximation.			II. Fourth Approximation.			III. Final Approximation.		
	x	y		x	y		x	y
k	+ ″·021	+ ″·027	k	+ ″·022	+ ″·029	k	+ ″·021	+ ″·029
l	− ·207	− ·048	l	− ·198	− ·038	l	− ·198	− ·040
m	− ·064	− ·046	m	− ·053	− ·044	m	− ·053	− ·042
n	− ·149	− ·016	n	− ·136	− ·016	n	− ·133	− ·012
o	− ·121	− ·088	o	− ·114	− ·076	o	− ·117	− ·080
p	− ·021	+ ·037	p	− ·027	+ ·032	p	− ·034	+ ·031
q	+ ·090	+ ·071	q	+ ·050	+ ·080	q	+ ·046	+ ·077
r	+ ·134	− ·069	r	+ ·129	− ·047	r	+ ·131	− ·044
s	− ·005	+ ·054	s	− ·030	+ ·045	s	− ·033	+ ·043
t	− ·005	− ·029	t	− ·013	− ·029	t	− ·009	− ·026
u	− ·026	+ ·042	u	− ·025	+ ·045	u	− ·025	+ ·047
v	− ·125	− ·021	v	− ·111	− ·025	v	− ·110	− ·024
w	+ ·085	+ ·002	w	+ ·078	− ·013	w	+ ·077	− ·013
x	+ ·063	+ ·002	x	+ ·039	− ·014	x	+ ·039	− ·015
y	− ·132	+ ·017	y	− ·138	+ ·011	y	− ·138	+ ·011
z	+ ·053	+ ·008	z	+ ·048	+ ·006	z	+ ·049	+ ·005
α	+ ·095	− ·017	α	+ ·081	− ·032	α	+ ·079	− ·031
β	− ·031	− ·073	β	− ·006	− ·088	β	− ·006	− ·088
γ	+ ·125	− ·039	γ	+ ·108	− ·030	γ	+ ·107	− ·030
δ	− ·070	+ ·023	δ	− ·057	+ ·022	δ	− ·054	+ ·023
ε	− ·052	− ·004	ε	− ·046	+ ·012	ε	− ·046	+ ·012
ζ	− ·042	− ·097	ζ	+ ·020	− ·086	ζ	+ ·027	− ·087
η	− ·039	+ ·028	η	− ·042	+ ·027	η	− ·042	+ ·027
θ	− ·091	+ ·101	θ	− ·067	+ ·092	θ	− ·064	+ ·091
ι	+ ·140	+ ·009	ι	+ ·119	+ ·009	ι	+ ·119	+ ·009
κ	+ ·069	− ·096	κ	+ ·071	− ·068	κ	+ ·064	− ·066
λ	+ ·157	+ ·010	λ	+ ·116	+ ·013	λ	+ ·112	+ ·013
μ	− ·124	+ ·031	μ	− ·073	+ ·020	μ	− ·065	+ ·018
E	+ ·174	+ ·549	E	+ ·173	+ ·524	E	+ ·169	+ ·520
F	+ ·058	+ ·339	F	+ ·071	+ ·346	F	+ ·074	+ ·345

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CHAPTER X.

Definitive Results from the Triangulation, with their Probable Errors.

A determination of the weights of the 78 unknown quantities by the usual method of least squares is a very laborious process, but in the present case it can be accomplished with any desired accuracy in a much simpler way.

In chapter IX., p. 184, it is shewn that the weights p', attached to the values of x and y for each star, are the true weights of these co-ordinates if the terms III. and IV. did not exist.

Since $\pm\ 0''\cdot 2$ has been adopted for the estimated *mean error* of an observation of weight *unity*, let us write for any star—

$$\rho^2_x = \frac{(\pm\ 0\cdot 2)^2}{p'_x}\ ;\ \text{and}\ \rho^2_y = \frac{(\pm\ 0\cdot 2)^2}{p'_y}\ \ldots\ldots\ldots(1)$$

then, if the corrections III. and IV. did not exist in the expressions for the values of x and y respectively, we should have for any star—

$$\rho^2_x = \epsilon^2_x\ ;\ \text{and}\ \rho^2_y = \epsilon^2_y$$

(where ϵ_x and ϵ_y are the mean errors of the co-ordinates in x and y, any particular star afterwards referred to being indicated by an additional suffix—such as ϵ_{xa} or ϵ_{yb}, &c.). But in reality—

$$x = n + \text{III.}\ \text{and}\ y = n' + \text{IV.}$$

where n and n' are the first approximations to the values of x and y, and III. and IV. are the definitive corrections to the first approximations, viz. :

$$\text{III.} = \left\{\begin{matrix} \alpha_1\, x_a + \beta_1\, y_a \\ \alpha_2\, x_b + \beta_2\, y_b \\ \alpha_3\, x_c + \beta_3\, y_c \\ +\ \&c. \quad +\ \&c. \end{matrix}\right\}\ ;\quad \text{IV.} = \left\{\begin{matrix} \gamma_1\, x_a + \delta_1\, y_a \\ \gamma_2\, x_b \quad \delta_2\, y_b \\ \gamma_3\, x_c \quad \delta_3\, y_c \\ +\ \&c. \quad +\ \&c. \end{matrix}\right\}$$

Therefore we have :

$$\epsilon^2_x = \rho^2_x + \left\{\begin{matrix} \alpha^2_1\, \epsilon^2_{xa} + \beta^2_1\, \epsilon^2_{ya} \\ \alpha^2_2\, \epsilon^2_{xb} + \beta^2_2\, \epsilon^2_{yb} \\ \alpha^2_3\, \epsilon^2_{xc} + \beta^2_3\, \epsilon^2_{yc} \\ +\ \&c. \quad +\ \&c. \end{matrix}\right\}\ ;\quad \epsilon^2_y = \rho^2_y + \left\{\begin{matrix} \gamma^2_1\, \epsilon^2_{xa} + \delta^2_1\, \epsilon^2_{ya} \\ \gamma^2_2\, \epsilon^2_{xb} + \delta^2_2\, \epsilon^2_{yb} \\ \gamma^2_3\, \epsilon^2_{xc} + \delta^2_3\, \epsilon^2_{yc} \\ +\ \&c. \quad +\ \&c. \end{matrix}\right\}\ldots\ldots(2)$$

which we may write in the form :

$$^2_x = \rho^2_x + \epsilon^2_{\text{III.}}\ \text{and}\ \epsilon^2_y = \rho^2_y + \epsilon^2_{\text{IV.}}$$

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Since the coefficients α, β, γ and δ are small, and only their squares appear in the terms ϵ^2_{III} and ϵ^2_{IV}, the values of these latter can be readily found by successive approximation in terms of ρ^2_x and ρ^2_y, and we may write our equation for the true value of the square of the mean error of x in the form.

$$\left.\begin{array}{l} \epsilon^2_x = \rho^2_x + \epsilon^2_{\text{III}_1} + \epsilon^2_{\text{III}_2} + \epsilon^2_{\text{III}_3} + \&c. \\ \text{and similarly for the square of the mean error of } y \\ \epsilon^2_y = \rho^2_y + \epsilon^2_{\text{IV}_1} + \epsilon^2_{\text{IV}_2} + \epsilon^2_{\text{IV}_3} + \&c. \end{array}\right\} \ldots\ldots(3)$$

where

$$\epsilon^2_{\text{III}_1} = \left\{\begin{array}{c} \alpha^2_1\,\rho^2_{xa} + \beta^2_1\,\rho^2_{ya} \\ \alpha^2_2\,\rho^2_{xb} + \beta^2_2\,\rho^2_{yb} \\ \alpha^2_3\,\rho^2_{xc} + \beta^2_3\,\rho^2_{yc} \\ + \&c. + \&c. \end{array}\right\}; \quad \epsilon^2_{\text{IV}_1} = \left\{\begin{array}{c} \gamma^2_1\,\rho^2_{xa} + \delta^2_1\,\rho^2_{ya} \\ \gamma^2_2\,\rho^2_{xb} + \delta^2_2\,\rho^2_{yb} \\ \gamma^2_3\,\rho^2_{xc} + \delta^2_3\,\rho^2_{yc} \\ + \&c. + \&c. \end{array}\right\}$$

$$\epsilon_{\text{III}_2} = \left\{\begin{array}{c} \alpha^2_1\,\epsilon^2_{\text{III}a_1} + \beta^2_1\,\epsilon^2_{\text{IV}a_1} \\ \alpha^2_2\,\epsilon^2_{\text{III}b_1} + \beta^2_2\,\epsilon^2_{\text{IV}b_1} \\ \alpha^2_3\,\epsilon^2_{\text{III}c_1} + \beta^2_3\,\epsilon^2_{\text{IV}c_1} \\ + \&c. + \&c. \end{array}\right\}; \quad \epsilon^2_{\text{IV}_2} = \left\{\begin{array}{c} \gamma^2_1\,\epsilon^2_{\text{III}a_1} + \delta^2_1\,\epsilon^2_{\text{IV}a_1} \\ \gamma^2_2\,\epsilon^2_{\text{III}b_1} + \delta^2_2\,\epsilon^2_{\text{IV}b_1} \\ \gamma^2_3\,\epsilon^2_{\text{III}c_1} + \delta^2_3\,\epsilon^2_{\text{IV}c_1} \\ + \&c. + \&c. \end{array}\right\}$$

$$\epsilon^2_{\text{III}_3} = \left\{\begin{array}{c} \alpha^2_1\,\epsilon^2_{\text{III}a_2} + \beta^2_1\,\epsilon^2_{\text{IV}a_2} \\ \alpha^2_2\,\epsilon^2_{\text{III}b_2} + \beta^2_2\,\epsilon^2_{\text{IV}b_2} \\ \alpha^2_3\,\epsilon^2_{\text{III}c_2} + \beta^2_3\,\epsilon^2_{\text{IV}c_2} \\ + \&c. + \&c. \end{array}\right\}; \quad \epsilon^2_{\text{IV}_3} = \left\{\begin{array}{c} \gamma^2_1\,\epsilon^2_{\text{III}a_2} + \delta^2_1\,\epsilon^2_{\text{IV}a_2} \\ \gamma^2_2\,\epsilon^2_{\text{III}b_2} + \delta^2_2\,\epsilon^2_{\text{IV}b_2} \\ \gamma^2_3\,\epsilon^2_{\text{III}c_2} + \delta^2_3\,\epsilon^2_{\text{IV}c_2} \\ + \&c. + \&c. \end{array}\right\}$$

&c. &c.

The numerical values of ρ^2_x, ρ^2_y, $\epsilon^2_{\text{III}_1}$, $\epsilon^2_{\text{IV}_1}$, $\epsilon^2_{\text{III}_2}$ and $\epsilon^2_{\text{IV}_2}$ have been computed for all the stars, and are given in the following Table XVII.

The terms $\epsilon^2_{\text{III}_3}$, $\epsilon^2_{\text{IV}_3}$ are obviously so small that they can be inferred by analogy with all desirable accuracy, and are entered in the table by estimation.

The reciprocal of the sum of the four terms of Equation (3) for any co-ordinate, multiplied by the square of the assumed mean error of an observation of weight

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unity (in the present instance $(0{\cdot}2)^2$) is the true weight of the determination of the co-ordinate. That is, if p_x and p_y are the true weights,

$$p_x = \frac{0{\cdot}04}{\epsilon^2_x} \quad ; \quad p_y = \frac{0{\cdot}04}{\epsilon^2_y}$$

where ϵ^2_x and ϵ^2_y are determined by formula (3).

The weights so computed are independent of the assumed value of the mean error(*) ; it is only convenient to assume a true value of the mean error corresponding to weight unity, because the squares of the mean errors of the co-ordinates are thus obtained without further calculation, and at the same time a better judgment can be formed as to when the successive approximations have been carried sufficiently far.

TABLE XVII.

Deduction of Weights of x and y.

Star.	ρ^2_x	$\epsilon^2 III_1$	$\epsilon^2 III_2$	$\epsilon^2 III_3$	ϵ^2_x	p_x	ρ^2_y	$\epsilon^2 IV_1$	$\epsilon^2 IV_2$	$\epsilon^2 IV_3$	ϵ^2_y	p_y
a	·001922	356	63	10	·002351	17·0	·001985	263	26	3	·002277	17·6
b	2825	469	73	12	3379	11·8	1637	206	33	6	1882	21·3
c	1843	222	37	6	2108	19·0	1608	170	23	3	1804	22·2
d	1489	250	38	5	1782	22·4	1145	135	17	2	1299	30·8
e	1114	196	22	3	1335	30·0	1310	162	16	2	1490	26·8
f	892	127	15	2	1036	38·6	1204	139	14	1	1358	29·4
g	1449	136	14	2	1601	25·0	1649	124	9	1	1783	22·4
h	1599	188	22	2	1811	22·1	1875	151	13	1	2040	19·6
i	1995	121	13	1	2130	18·8	1960	112	8	1	2081	19·2
k	1145	163	16	2	1326	30·2	1318	138	12	1	1469	27·2
l	6359	173	16	2	6550	6·1	2327	84	6	0	2417	16·5
m	655	105	11	1	772	51·8	1025	149	13	1	1188	33·7
n	1533	182	17	2	1734	23·1	1322	126	9	1	1458	27·4
o	1763	166	19	2	1950	20·5	2109	138	16	2	2265	17·7
p	660	118	13	1	792	50·5	1021	141	12	1	1174	34·1
q	756	105	12	1	874	45·8	1356	149	18	2	1525	26·2
r	2127	224	21	2	2374	16·8	1321	153	15	2	1491	26·8
s	1315	230	31	4	1580	25·3	1218	175	19	2	1414	28·3
t	715	144	18	2	879	45·5	988	128	16	2	1134	35·3
u	1088	219	20	2	1329	30·1	2083	175	25	4	2287	17·5
v	954	136	18	2	1110	36·0	1992	169	25	4	2190	18·3

(*) If, for example, a mean error $= \pm 1''{\cdot}0$ had been assigned to weight *unity*, the reciprocals of ϵ^2_x and ϵ^2_y would become directly the weights x and y.

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TABLE XVII.—*continued.*

Star.	ρ^2_x	$\epsilon^2 III_1$	$\epsilon^2 III_2$	$\epsilon^2 III_3$	ϵ^2_x	p_x	ρ^2_y	$\epsilon^2 IV_1$	$\epsilon^2 IV_2$	$\epsilon^2 IV_3$	ϵ^2_y	p_y
w	·001054	104	13	2	·001173	34·1	·001533	139	13	1	·001686	23·7
x	1152	129	17	2	1300	30·8	1429	141	13	1	1584	25·3
y	1489	170	19	2	1680	23·8	1643	132	10	1	1786	22·4
z	1499	158	18	2	1677	23·9	1452	136	9	1	1598	25·0
α	1579	358	63	10	2010	19·9	2019	151	15	2	2187	18·3
β	2374	304	43	6	2727	14·7	2688	183	20	2	2893	13·8
γ	1861	304	34	4	2203	18·2	2448	115	13	2	2578	15·5
δ	1773	279	54	11	2117	18·9	1642	121	14	2	1779	22·5
ε	1598	262	24	2	1886	21·2	1394	191	14	1	1600	25·0
ζ	2559	439	93	19	3110	12·9	2057	156	20	3	2236	17·9
η	2667	342	46	6	3061	13·1	2124	172	21	3	2320	17·2
θ	1768	295	57	11	2131	18·8	1729	130	18	2	1879	21·3
ι	6568	341	55	9	6973	5·7	3828	48	7	1	3884	10·3
κ	2318	652	187	54	3211	12·5	1778	267	39	6	2090	19·1
λ	1997	373	60	10	2440	16·4	1665	259	32	4	1960	20·4
μ	2649	511	137	36	3333	12·0	1682	118	32	8	1840	21·7
E	1694	249	38	6	1987	20·1	1873	239	27	3	2142	18·7
F	·002541	506	83	14	·003144	12·7	·002281	299	28	3	·002611	15·3

The resulting mean errors for the various classes of observation, of an observation to which weight unity has been assigned, are

			Mean Error of an Observation of Weight Unity.
For the Heliometer Observations of Distance		$\epsilon\epsilon = 0{\cdot}0507$;	$\epsilon = \pm 0''{\cdot}225$
,, ,, ,,	Position-Angle	= ·0483 ;	$= \pm 0{\cdot}220$
,, Meridian ,,	Right Ascension	= ·0311 ;	$= \pm 0{\cdot}176$
,, ,, ,,	Declination	= ·0373 ;	$= \pm 0{\cdot}193$
From all observations combined	... ...	$\epsilon\epsilon$ = ·0459 ;	$\pm 0''{\cdot}214$

Thus the Heliometer Distances and Position-Angles have been assigned weights about 20% too high, which may be partly due to under-estimation of the effects of errors in the determination of the proper motions, but chiefly for reasons confirming the conclusion independently arrived at in the end of Chap. VI., viz.: that "there are small systematic peculiarities in an observer's habit of pointing, which are different for different pairs of stars," and it seems from the above evidence that these peculiarities are in some cases shared by several observers in the same sense—for example, note the agreement for all the observers of the residuals in pairs 5, 7, 40, 84, 131, 151, &c.,

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Table XVIII. Hence when the highest accuracy is required it is necessary "to measure the distance of each star from the largest possible number of different stars, rather than to limit the same number of observations to a much smaller number of different stars which may be selected so as best to satisfy the mere geometrical conditions of the problem."

The weights of the Meridian Observations were discussed in Chap. VII. at p. 161, and, as the results of that discussion, the equivalents of the weights assigned by Auwers, were, in the case of the Right Ascensions, diminished by about 29%, and those of the Declinations increased by 33%. Our results shew that it would have been better if Auwers' weights of the Right Ascensions had been diminished 8% instead of 29%, and the weights of the Declinations increased by 41% instead of 33%. The only material at my disposal for determining the weights of the Meridian Observations was that employed in the above mentioned discussion in Chap. VII., viz., the discordances between the computed and observed heliometer distances—if the errors of the latter could be correctly estimated the former became known; hence any under-estimation of the errors of the Heliometer Observations must lead to an over-estimation of the errors of the Meridian Observations. The cause of the under-estimation of the errors of the Heliometer Observations (viz., constant errors not eliminated in the mean of all the observers) has now been satisfactorily traced. The final corrections to the Declinations are, however, so small that another solution of the equations with the above modified weights would in no case affect the co-ordinates by the amount of their probable errors, and certainly the gain in probable accuracy would in no degree repay the great labour which another solution would involve; and in the case of the Right Ascensions the final results depend so much more upon the Heliometer than the Meridian Observations, that a small change in the weight of the latter would produce no sensible effect on the results. The present solution may therefore be accepted as final, provided that the weights which have been assigned to the various observers are sufficiently exact, and it can be shewn that the proper systematic corrections have been applied to their observations. Considering in the first place the very different weights that have been assigned to the observations of different distances—we have for the mean

Distances.	n_1	$\frac{p\,vv}{n_1}$	Corresponding Mean Error for Weight *Unity*.
0″ to 3000″	32	·0309	± 0·207″
3000 to 5000	65	·0263	± ·195
5000 to 7000	75	·0394	± ·226

Thus the much smaller weights assigned to the larger distances are fully justified,

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The actual mean errors of observations of weight unity by the various observers are similarly

Distance.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
	ε n_1	ε n_1	ε n_1	ε n_1	ε n_1	ε n_1
0″ to 3000″	± ″·223 (32)	± ″·244 (32)	± ″·209 (25)	± ″·217 (31)	± ″·234 (15)	± ″·211 (18)
3000 to 5000	·221 (65)	·239 (64)	·194 (42)	·219 (64)	·198 (39)	·211 (31)
5000 to 7000	·213 (74)	·214 (75)	·204 (47)	·236 (67)	·236 (29)	·217 (46)

The weights for the various distances may therefore be considered to be assigned as accurately as can be expected. In the mean we have for each observer the following values of $\frac{[p\ vv]}{n_1}$ (after deducting ·0017, which is the mean square of the mean error of the determination of the proper motion in distance).

— —	$\left(\frac{p\ vv}{n_1} - \cdot 0017\right)$	Factor.	Weight of Factor.
Gill	·0361	·77	356
Finlay	·0405	·69	230
Jacoby	·0286	·98	36
Chase	·0392	·71	122
Schur	·0361	·77	67
Ambronn	·0338	·83	43

The Factors given above are, as before, the Factors required to reduce $\left(\frac{p\ vv}{n_1} - \cdot 0017\right)$ to 0·0279; that is to say the Factors by which the adopted weights for each observer should be multiplied.

The weights of the Factors are simply the sums of the weights which have been assigned to the distances measured by each observer. Having regard to these weights the resulting mean Factor is

0·76

The corresponding Factor from the combined observations of distance is

0·80

Thus, whilst the measures of the individual observers are affected by systematic errors which diminish their weights by 24% on the average, the weight of the mean of the observers is affected by only 20%—a proof that the personal errors are to a

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sensible extent eliminated in the mean of results by several observers. There should, therefore, be added to the general conclusion at the end of Chapter VI., "*and further, the work should be shared by the largest available number of instruments and observers.*"

These conclusions amply justify the original plan of this work.

We are now in a position to determine the actual probable errors of each observer's work.

Multiplying the corresponding adopted weights of Table IX., Chap. VII., by the above Factors, the following Table of Weights for measures of different distances by each observer is obtained :—

Distance.	Gill's Weights.	Finlay's Weights.	Jacoby's Weights.	Chase's Weights.	Schur's Weights.	Ambronn's Weights.
1000″	2·33	1·86	0·74	·43	1·16	·90
2000	1·56	1·24	·56	·39	·79	·66
3000	1·09	·88	·39	·36	·53	·46
4000	·82	·67	·29	·32	·39	·36
5000	·69	·54	·20	·28	·27	·29
6000	·59	·43	·16	·24	·23	·23
7000	·52	·36	·14	·21	·21	·21

and these weights should be employed if at any future time a re-discussion of the work is undertaken.

The resulting probable errors for the different observers in measuring different distances are

Distance.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
1000″	± ″·088	± ″·099	± ″·157	± ″·206	± °·125	± ″·142
2000	·108	·121	·180	·216	·152	·166
3000	·129	·144	·216	·225	·185	·199
4000	·149	·165	·251	·239	·216	·225
5000	·162	·184	·302	·255	·260	·251
6000	·176	·206	·337	·276	·282	·282
7000	·187	·225	·361	·295	·295	·295

These probable errors include the effect of accidental errors in measurement of the Standard Stars, and of all systematic errors personal or instrumental.

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The mean observed Distances are represented as follows :

Distances.	C — O.	Weight.
0″ to 1500″	— ″·008	52·7
1500 to 2500	— ·014	104·8
2500 to 3500	— ·005	131·2
3500 to 4500	+ ·012	142·2
4500 to 5500	— ·015	111·8
5500 to 6500	— ·032	104·4
6500 to 7200	+ ·023	68·1

a representation which completely justifies the mean corrections for systematic error.

The observations of the individual observers are represented as follows :

Distances.	Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.	
″ ″	C — O ″	p	C — O ″	p	C — O ″	p	C — O ″	p	C — O ″	p	C — O ″	p
0 to 1500	·000	26·1	+ ·011	21·5	— ·078	4·3	— ·024	6·5	— ·047	7·8	+ ·052	4·0
1500 to 2500	— ·006	58·5	— ·023	36·6	— ·006	6·8	— ·005	14·6	— ·123	11·3	+ ·014	10·4
2500 to 3500	+ ·003	62·7	— ·034	39·8	+ ·095	8·0	+ ·053	24·0	+ ·035	20·0	— ·064	4·9
3500 to 4500	+ ·012	68·5	+ ·040	48·2	+ ·059	7·2	+ ·016	25·8	— ·072	13·6	— ·011	6·5
4500 to 5500	— ·046	52·8	+ ·024	34·5	— ·007	4·8	— ·023	22·1	+ ·044	4·3	— ·019	8·1
5500 to 6500	— ·016	51·6	— ·039	31·8	— ·019	3·0	— ·064	19·1	— ·039	5·9	— ·065	5·6
6500 to 7200	+ ·029	35·9	— ·008	17·5	+ ·145	2·1	+ ·051	12·2	+ ·021	4·2	— ·040	3·6

These residuals are in every instance within the limits of possible accidental error, being in no case in excess of twice the mean error indicated by the weights. If to them are added the corresponding corrections (Table VII.) which were applied to the original observations, the following corrections are obtained which would reduce the residuals of each group to zero, viz. :—

C – O.

Mean Distance.	Gill.	Finlay.	Jacoby.	Chase.	Schur.	Ambronn.
1000″	+ ″·03	+ ″·07	+ ″·18	+ ″·14	+ ″·20	+ ″·14
2000	+ ·01	·00	+ ·13	+ ·08	+ ·03	+ ·02
3000	+ ·01	— ·04	+ ·13	+ ·08	+ ·09	— ·11
4000	+ ·01	·00	·00	— ·01	— ·08	— ·11
5000	— ·06	— ·05	— ·15	— ·10	— ·01	— ·15
6000	— ·04	— ·13	— ·21	— ·18	— ·12	— ·22
7000	·00	— ·12	— ·12	— ·08	— ·07	— ·21

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These results, which depend on no assumed law, prove beyond doubt our two chief conclusions with respect to systematic error, viz. :—

1st. That the Standard Distance has been measured somewhat differently by different observers; were it otherwise the distances measured by all the observers between 6,000″ and 7,000″ should have agreed within the limits of accidental error.

2nd. That all the observers, without exception, measure the short distances too short—that is to say they require, as above, a positive correction.

The first of these points is sufficiently discussed in Chap. VI., but it is necessary to seek some *vera causa* for the second.

It seemed to me that a not improbable origin of the second class of errors might be sought in the fa·t that no Heliometer observer makes his pointings by superposing the images, but by causing them to pass through each other. The theory has been till now held that in so doing the observer measures his distances too great, and they require a correction

$$= -s\,(\text{Sec. } \psi - 1)$$

where ψ is the extreme angle through which the axis is rotated from the true position angle, and s is the observed distance, and Auwers has conclusively shewn the necessity for this correction in observations made with the old heliometers.

In these instruments there existed no means of illuminating the field, and no wires or webs were used, except perhaps cross spider webs employed in verification of the equatorial adjustment, and these are of course invisible in ordinary observations in a non-illuminated field. The only way, therefore, in which an observer could estimate the passage of the discs through each other with such an instrument, would be to endeavour to place the two discs in a line that is a common tangent to circles whose radii are each equal to half the distance.

The following Figs. 1, 2, and 3 represent such an observation.

Fig. 1.

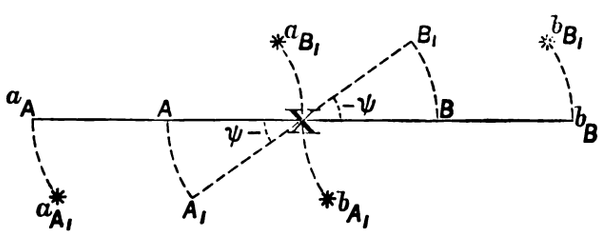

Fig. 2.

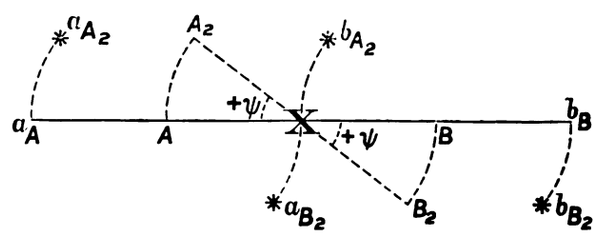

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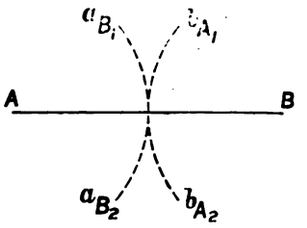
Fig. 3.



If the Heliometer axis of rotation is pointed to X (the middle point between the stars) and the optical axis A of segment A is directed to Star b, and B, that of segment B, to Star a, then if AB is the true distance between the stars (a being the right hand star in the sky), the image b_A (of Star b formed by segment A) and the image a_B (of Star a formed by segment B) would be superposed at the point X.

If now, without changing the distance of the segments, the Heliometer-tube is turned about its axis through the angle ψ so that the optical centre of segment A is moved to A_1 or A_2 (Figs. 1 and 2) the loci of the images of the Stars will be similarly moved to the positions shown in Figs. 1, 2 and 3 (but actually in the opposite direction from the motion of the optical centres). That is to say, the image formed by segment A will move in the arc of a circle whose centre is B, and the image formed by segment B in the arc of a circle whose centre is A, the radii of both circles being $= \frac{1}{2} s$.

Since the superposition of two images is not an accurate method of measuring, every Heliometer observer tries to make the images pass and re-pass through each other by a small motion in position-angle, ψ, and which, for sake of clearness, is greatly exaggerated in the above figures. When there are no wires visible in the field as a guide to direction, the only method by which any direction in the field can be estimated is to make the images alternately "swing through" and replace each other by rotating the tube in position-angle rapidly and alternately through *plus* and *minus* ψ. (The equality of the two angles ψ is easily estimated in terms of the diameters of the star discs.) That is to say, in making the "pointing" or adjustment of the distance, the observer's attention becomes directed to placing the images in the common tangent to the two circles described by the images under observation at the extremity of the arc of motion in position-angle (Fig. 3), and to do this he must *increase* the distance of the optical centres.

His observed scale-readings will therefore practically represent

$$s. \sec. \psi \text{ and not } s,$$

and will require the correction $- s (\sec. \psi - 1)$.

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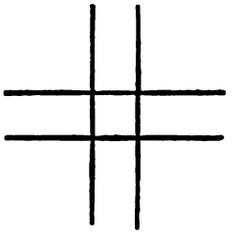
But in the modern Heliometer the field is illuminated, and in the common focus of the object-glass and eyepiece there is a square formed by the intersection of two pairs of metallic wires, thus :—

Fig. 4.



One pair of these wires is parallel to the line of motion of the segments in distance, the other pair being at right angles to the first. This system of wires *rotates with the axis* and becomes the means by which directions in the field are estimated. In causing the discs to pass through each other the observer instinctively uses the pair of lines at right angles to the distance-motion as a guide. He first turns the position-handle till the discs just pass clear of each other by alternately reversed movements of the distance-handle, and then adjusts the distance carefully till the stars appear thus (Fig. 5)*

Fig. 5.

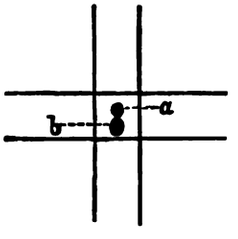
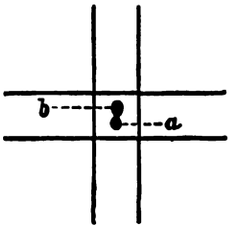


Fig. 6.



that is to say, like a double star of which the line joining the centres of the components is parallel to the two wires which are at right angles to the direction of motion of the slides (or as an observer would measure the position-angle of a double star between the two webs of a filar micrometer, excepting that he changes the apparent position-angle of the star by moving the segments in distance, instead of turning the micrometer in position-angle to make the wires parallel to the components of the star). As a control, the Heliometer observer immediately reverses the positions of the components of his artificial double star by motion in position-angle (as in Fig. 6), when, if the images after this exchange still appear parallel to the wires, he reads or otherwise records the distance.

The most refined judgment of this parallelism with the wires is inseparable from the plan of rapidly "crossing" (that is exchanging the position of) the images. The

* This adjustment is greatly facilitated by the elongated form of the discs in a direction at right angles to the line of section of the object-glass.

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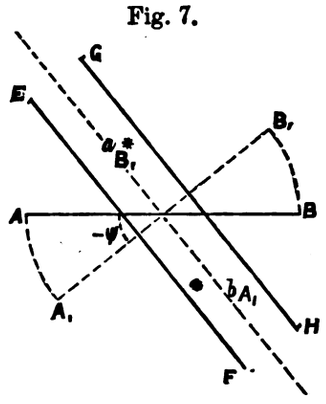
eye in this operation is extremely sensitive to a very minute change in the apparent position-angle, and the method is probably the most refined that we possess as a practical means of measuring the angle between optical discs with a high precision.*

In Fig. 7, which otherwise resembles Fig. 1, let the lines EF, GH represent the wires in the field of a Modern Heliometer which are at right angles to the line of motion of the slides, and therefore at right angles to the line A_1 B_1. In order to make the line joining the images a_{B_1} and b_{A_1} parallel to EF and GH the distance between the optical centres A_1 and B_1 must be diminished.

Fig. 7.



The separation of the segments thus becomes

$$2 \cdot \frac{s}{2} \cos \psi = s \cdot \cos \psi$$

instead of s.

If κ be the distance of the artificial double star formed as in Fig. 5 or Fig. 6 the correction to the observed distance will be

$$+ s \left(1 - \sqrt{1 - \frac{\kappa^2}{s^2}}\right)$$

or if κ is small in comparison with s the correction becomes

$$+ \frac{\kappa^2}{2s} = s. \sin^2 \tfrac{1}{2} \psi$$

* Such at least is my own manner of observing; the same plan is followed by Mr. Finlay, and, I believe, by other observers with modern Heliometers.

When the distances are so small as to require a considerable motion in position-angle to exchange the images, and where consequently it is necessary to know the value of ψ, I have been in the habit of pointing first as in Fig. 5 and reading the position angle (to the nearest minute of arc), as well as the distance, and then crossing the images, as in Fig. 6, and again reading position-angle and distance. No distances occur in the triangulation which require this method, but they occur in several instances in the observations of Victoria.

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and amounts to

For κ =		5″	10″	20″
and s =	100″	0″·125	0″·50	2″·00
	200	·052	·25	1·00
	500	·025	·10	40
	1000	·012	05	·20
	2000	·006	·025	·10
	5000	·002	·01	·04

In the absence of data as to the values of ψ or κ employed by the different observers, it is impossible to apply corrections for the amount of "crossing through" of the images. Equations of condition might be employed to determine κ for each observer of the form

$$s\,a + \frac{1}{2s}\kappa^2 = \mathrm{C} - \mathrm{O}$$

Where a is the correction for scale-value on account of the observer's habit of "pointing" on the standard stars. But there are few short distances in the triangulation (only two less than 1000″) so that κ could not be determined with sufficient weight, and besides this κ probably varies with the quality of the definition and with the magnitude of the stars under observation. In my own usual habit of observing, I endeavour always to make the artificial double star (Figs. 5 and 6), as close as possible - in very steady definition even—so close that the discs are in contact, or slightly intersecting, thus for images and steadiness 1 and 2 my value of κ is from 2½″ to 4″, but when the images are blurred and unsteady κ may amount to 5″, or in extreme cases to 7″, but not more, and Mr. Finlay observes in much the same way.

If the other observers employ values of κ between 10″ and 20″ the systematic errors of their measures of the shorter distances would be explained, whilst the negative corrections of the longer distances are explained by a different habit of bisecting the standard stars.

The whole question has little practical bearing on the results of the triangulation, because the necessary systematic corrections have been otherwise found, and these satisfy each group of mean distance with all requisite accuracy.

But the matter has an important bearing on the observations of Victoria where

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very short distances have often been observed, and the preceding discussion may be regarded as introductory to the methods employed for their reduction.*

In all future operations of a similar kind the observer should carefully estimate the value of κ for all observations of distance above 1000″, and, for all distances less than 1000″ the value of ψ should be observed with the position-circle.

Meanwhile, since the systematic corrections found by an empirical process satisfy our present problem with all necessary accuracy, we may accept as definitive the values of x and y given in Table XVI. column III., and the mean error of an observation of weight unity

$$\pm\ 0''\cdot 214$$

as derived in the present chapter.

Combining these results with the data of Table V, and the weights of Table XVII. we have the following definitive places of the Victoria comparison stars, together with the probable errors of their determination.

---

*In connection with this subject it may be well to point out that when the observed distance is so small that the images a_B and b_A are seen in the field of view at the same time with the images a_A and b_B it is most probable that in using the old form of Heliometer the observer will employ the images a_B and b_A as his guide in "crossing through" the images of the stars a_B and b_A, that is to say he will have a natural tendency to adjust the position angle of his artificial double star at right angles to the line joining the two other stars in the field.

If such observations are represented by diagrams (similar to Figs. 1 and 2) it will be seen that *whatever the value of ψ the distance is measured without error*, so long as the line joining the images a_B and b_A is placed at right angles to the line joining the images a_A and b_B. My attention was first directed to this by Elkin, but Airy has recommended the method in connection with the use of his Double Image Micrometer.

In future it may be well, even with the modern Heliometer, in measuring very short distances to adopt this method, especially if, as in the case of the Cape instrument, means are provided for sliding the square of wires out of the field of view.

It is evident that very small distances could be very exactly observed

thus $\cdot\ \begin{smallmatrix}\cdot\\ \cdot\end{smallmatrix}\ \cdot$ or even thus $\cdot\begin{smallmatrix}\cdot\\ \cdot\end{smallmatrix}\cdot$

This method of pointing, combined with the symmetrical use of the reversing prism, is entirely free from all systematic error. If, however, it is not possible to slide the "square" out of the field of view, the observer will find it difficult to satisfy himself between two conflicting guides—at least this is my own experience in some trials which I have made of the method.

D. G.

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Definitive Places of the Victoria Comparison Stars.

Equinox 1889·0. Epoch 1889·55.

Star.	R.A. in Time.	R.A. in Arc.	Probable Error of R.A.	Declination.	Probable Error of Declination.	μ	μ^1	Probable error of μ or μ^1.
	h m s	° ′ ″		° ′ ″	″	″	″	″
a	19 21 25·200	290 21 18·00	±·034	−5 57 20·86	±·034	−·009	−·010	±·013
b	23 2·485	45 37·28	·042	−6 24 0·52*	·031	−·018	+·003	·015
c	24 6·224*	291 1 33·37	·033	−5 9 5·82	·030	−·054	+·016	·022
d	25 17·932	19 28·98	·030	−5 54 12·54*	·026	−·006	−·008	·020
e	25 40·295	25 4·42*	·027	−5 21 2·34	·028	−·057	−·062	·018
f	27 50·503*	57 37·55	·024	−4 58 48·96	·027	−·018	+·004	·011
g	28 37·608	292 9 24·11*	·029	−4 41 23·26	·030	+·015	+·015	·024
h	29 20·727	20 10·90	·031	−4 33 5·37	·032	−·008	−·013	·011
i	30 41·136	40 17·03*	·033	−5 1 2·44	·033	...	...	·049
k	30 53·379	43 20·69	·026	−4 32 43·39	·028	+·036	−·024	·020
l	31 22·109	50 31·63	·059	−3 43 18·95	·035	...	...	·040
m	31 53·995	58 29·93	·020	−4 53 40·08	·025	+·084	−·045	·007
n	34 26·876	293 36 43·14	·030	−5 42 7·33	·028	−·010	·000	·011
o	34 53·498	43 22·47	·032	−4 17 21·16	·034	+·018	+·014	·022
p	35 56·005	59 0·07	·020	−4 32 49·33	·025	−·021	+·004	·011
q	39 23·665	294 50 54·98	·021	−4 47 22·28	·028	−·015	+·007	·011
r	40 59·498	295 14 52·46*	·035	−3 56 0·57	·028	+·001	·000	·011
s	41 53·285	28 19·27	·029	−5 30 22·54	·028	−·016	+·014	·013
t	43 4·463	46 6·95	·021	−4 46 18·32	·025	−·010	−·016	·011
u	43 43·816	55 57·24*	·026	−4 48 25·24	·034	−·037	−·004	·013
v	44 56·178	296 14 2·66*	·024	−4 58 27·07	·034	−·003	−·004	·009
w	47 27 184	51 47·76	·025	−4 51 32·35	·030	−·048	+·015	·022
x	48 22·375	297 5 35·62	·026	−5 19 59·89*	·029	+·049	+·011	·016
y	51 25·861	51 27·91	·030	−4 58 53·86	·030	+·031	−·045	·019
z	52 3·490	298 0 52·35	·030	−5 28 58·91*	·029	...	...	·038
α	52 18·113	4 31·70	·032	−6 38 55·75	·034	−·054	−·001	·015
β	52 38·021*	9 30·32	·037	−4 39 16·34	·039	−·044	+·035	·013
γ	54 57·309	44 19·64	·034	−4 36 52·23	·036	−·004	−·023	·009
δ	55 39·735	54 56·03	·033	−6 40 49·00	·030	−·033	+·021	016
ε	56 17·659*	299 4 24·89	·031	−5 17 48·65	·028	+·016	−·025	·013
ζ	57 4·780	16 11·70	·041	−8 0 14 38	·034	·000	−·100	·033
η	57 21·729	20 25·94	·040	−4 56 27 93	·034	−·061	+·017	·011
θ	59 23 786	50 56·79	·033	−6 53 57 31	·031	−·031	−·053	007
ι	20 0 44·858	300 11 12·87	·061	−4 44 4·02	·045	+·031	−·006	·011
κ	1 3·694	15 55·41	·041	−8 29 59·20	·033	+·021	−·022	·011
λ	2 45·810	41 27·16	·035	−7 20 32·96	·032	−·025	−·020	·015
μ	5 8·920	301 17 13·79*	·042	−9 10 12·56	·031	+·002	·000	·007
L	...	292 37 30·84	·032	−6 12 53 39	·033	...	...	...
F	...	296 51 35·54	±·041	−6 17 25 27*	±·036	...	...	...

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TABLE XVIII.

Comparison of the Definitive and Observed Distances.

C — O.

Rotation No.	Stars.	Final Computed Distance.	Cape Observations. Gill.		Cape Observations. Finlay.		Cape Observations. Jacoby.		Yale. Chase.		Göttingen. Schur.		Göttingen. Ambronn.		Mean C — O.	
		′	′	p	′	p	′	p		p	′	p	′	p	′	p
1	f n	6464·881	+·31	1·44	—·22	1·14	—1·05	0·15	+·09	0·96	+·04	0·29			+·035	3·8
2	f c	3407·345	+·23	1·86	+·00	1·15			+·69	0·48					+·222	3·1
3	p s	6358·023	+·32	1·44	—·13	1·16			+·09	0·64	+·27	0·29	—·43	0·27	+·090	3·6
4	p l	5061·074	+·01	0·89	+·12	0·78			—·36	0·39			—·04	(0·35)	—·018	1·95
5	q o	4223·104	+·32	1·55	+·15	1·15			+·25	0·88	+·17	0·94			+·236	3·9
6	q t	3301·063	—·05	2·88	—·04	2·66			—·06	1·44	+·13	1·28			—·018	7·4
7	e c	1577·275	—·14	5·42	—·00	2·14			—·07	1·14	—·25	2·44			—·135	7·5
8	e E	5327·079	·00	3·01	+·11	1·48			—·08	1·11			—·11	0·32	+·006	5·4
9	d a	3477·413	—·01	2·44	+·01	2·26			—·18	1·92	—·07	1·20			—·052	6·3
10	d E	4788·715	+·00	2·79	—·04	1·62	—·24	0·22	+·20	1·20			+·29	0·37	+·039	5·4
11	t r	3549·671	+·08	1·80	—·02	3·89			+·01	1·41	+·11	1·18			+·026	7·4
12	t F	6721·389	—·01	1·38	+·22	1·08			—·42	0·64			+·25	0·26	+·005	3·3
13	θ η	7280·782	+·05	1·32	+·11	0·77					+·25	0·52			+·110	2·55
14	θ κ	5950·193	—·06	1·54	+·14	0·95					—·69	0·60			—·118	3·0
15	λ θ	3404·129	—·23	2·48	+·24	1·73					—·03	1·22			—·036	5·1
16	λ κ	4433·861	+·02	3·96	—·10	2·64			—·29	0·84	—·25	0·45			—·068	6·8
17	m k	1549·317	+·04	4·86	—·21	4·34			—·03	1·14	—·07	2·46			—·075	9·8
18	m n	3696·760	—·09	2·32	+·20	2·14			+·37	0·92	—·28	1·12			+·038	6·15
19	z x	3345·678	—·22	1·58	+·03	2·34			+·02	0·96	+·39	1·24			+·035	3·8
20	z ε	3854·403	+·03	1·67	—·09	1·53			—·14	0·92	—·07	1·06			—·053	3·5
21	x s	5843·512	+·08	1·20	—·22	0·99			—·27	0·70			—·05	0·30	—·100	2·95
22	x ε	7099·830	—·05	2·00	—·23	1·16							+·08	0·50	—·089	3·4
23	k l	2995·443	—·06	1·42	—·29	1·27	—·37	0·40	+·09	0·50			—·35	0·56	—·178	2·8
24	k i	1708·877	+·02	2·29	+·07	2·02	—·40	0·59	+·01	0·56			—·09	0·88	—·022	3·2
25	y x	3019·386	+·01	1·41	—·27	1·27	—·19	0·40	+·05	0·50			—·12	0·56	—·112	3·6
26	y γ	3425·806	+·12	1·24	—·37	1·15	—·45	0·36	—·43	0·48			+·53	0·50	—·106	3·4
28	δ ζ	4930·463	—·02	1·36	—·05	0·79			—·25	0·78					—·086	2·4
29	ε γ	2734·177	—·05	1·16	+·03	0·35	+·26	0·44					+·11	0·62	+·050	2·5
30	ε θ	6401·850	—·06	1·44	+·04	1·16			—·01	0·65	—·09	0·53			—·026	3·7
31	ζ α	6479·911	—·07	3·20	+·16	1·14			—·16	0·64			—·06	0·46	—·029	3·8
32	ζ κ	3370·402	+·03	4·84	+·05	2·94			—·27	0·90			+·22	0·86	+·027	5·8
33	g c	4383·267	+·03	0·50	—·10	0·89	—·24	0·26	—·16	0·63					—·107	2·03
34	g k	2095·474	+·03	1·95	+·07	1·74	—·26	0·55	—·11	0·55			+·32	0·78	+·045	4·3
35	E b	6706·187	+·05	1·38	—·02	0·54			—·23	0·62			—·01	0·26	—·034	2·7
36	E n	3986·304	—·13	2·14	—·07	1·45	—·11	0·30	+·11	1·35			+·08	0·43	—·037	5·4
37	F s	5715·462	+·04	3·66	—·05	1·70			—·07	1·40			+·46	0·30	+·014	6·6
38	F α	4535·736	—·03	3·92	+·06	1·94			—·17	1·68			—·29	0·39	—·054	7·2

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TABLE XVIII.—*continued.*

Rotation No.	Stars.	Final Computed Distance.	Cape Observations.						Yale.		Göttingen.				Mean C—O.	
			Gill.		Finlay.		Jacoby.		Chase.		Schur.		Ambronn.			
		′	″	p	″	p	″	p	″	p	″	p	″	p	″	p
39	s n	6701·289	—·16	2·59	—·47	0·40			+·23	0·93	+·04	0·28			—·091	3·9
40	s w	5505·427	—·19	1·68	—·47	1·60			·00	0·70			—·30	0·31	—·274	3·7
41	r o	5623·594	—·18	1·24	—·09	0·88			—·07	0·72	+·26	0·34			—·079	2·9
42	r w	6687·227	+·02	1·04	—·31	0·81			—·01	0·93			·00	0·26	—·082	2·8
43	γ β	2087·464	+·19	1·95	—·21	1·74	+ ·20	0·55	+·26	0·55			—·43	0·78	—·010	5·1
44	γ η	2458·159	+·16	1·70	+·22	1·54	·00	0·48	+·04	0·53			—·18	0·69	+·102	4·7
45	w β	4704·430	—·44	1·19	—·10	0·82			+·13	0·82			—·04	0·38	—·160	2·9
46	w v	2294·555	+·00·	2·70	+·20·	1·63			+·15·	1·06			—·08·	0·73	+·074	5·1
47	n i	4176·273	—·07	2·06	+·01	0·93			—·14	0·44			+·30	0·41	—·016	2·5
48	n o	5101·719	+·27	1·11	—·08	1·14			+·61	0·77			—·36	0·34	+·164	3·0
49	i h	2063·291	+·13	4·95	—·26	0·88			—·71	0·55			+·07	0·79	+·012	3·6
50	b c	4594·263	—·27	1·92	—·01	1·68			·00	0·82			+·01	0·37	—·108	4·1
51	b a	2159·570	+·01	5·73	+·19	1·70			+·32	1·08			+·03	0·76	+·081	7·7
52	f i	2553·233	—·23	1·64	+·09	1·48	— ·05	0·47	+·33	0·52	+·35	0·83			+·042	2·9
53	f a	6740·367	+·05	2·07	—·04	0·53			+·36	0·60			—·59	0·26	+·039	3·2
54	p q	3224·962	+·09	5·28	—·31	1·21			+·03	1·47	+·07	0·65	—·30	0·53	+·005	8·0
55	p k	4525·105	+·04·	0·98	—·27·	0·86	+ ·01·	0·50	+·18·	0·84	+·02·	0·44	+·58·	0·38	+·051	3·6
56	q s	3413·786	+·06	3·72	—·09	1·73	+ ·19	0·36	—·22	1·44	—·02	0·61	—·44	0·50	—·053	7·3
57	q r	3398·718	+·21	3·72	+·03	1·73	— ·12	0·36	—·41	1·44	—·17	1·22			—·003	7·5
58	e i	4651·565	—·20·	1·44	+·22·	0·83	+ ·66·	0·23	+·23·	0·41	+·30·	0·42			+·081	2·2
59	e a	4386·949	—·27	1·00	—·65	0·45	+ ·15	0·26	+·08	0·86	+·28	0·45			—·110	2·8
60	d m	6940·902	+·17	2·03	+·08	0·52	+ ·39	0·14	—·20	0·90	—·21	0·54			+·038	3·7
61	d b	2697·651	—·04	1·57	—·07	1·40	+ ·57	0·48	—·11	1·03	+·02	1·56			+·006	5·0
62	t v	1821·767	+·05	3·26	—·21	1·92	+ ·12	0·60	—·04	1·12	—·16	2·22			—·065	8·2
63	t s	2850·021	—·05	3·75	+·26	2·01	+ ·43	0·43	—·21	1·53	—·10	1·48			+·007	8·0
64	θ δ	3429·025	—·16·	2·48	+·09·	1·15	+ ·24·	0·36	+·22·	0·96	+·03·	1·22			+·008	5·5
65	θ ζ	4482·342	+·02	1·98			+ ·22	0·25	—·26	0·84	—·31	0·89			—·099	3·2
66	λ μ	6914·024	+·01	2·70	+·01	0·78	— ·67	0·14	+·64	0·90	—·52	0·54			+·051	4·7
67	λ ζ	5601·102	+·05	4·15	—·03	1·23			—·37	0·72	—·39	0·66			—·050	4·6
68	m o	3457·027	+·10	1·23	—·20	1·14	+ ·44	0·36	—·20	0·48	+·13	0·60			+·006	3·5
69	m i	1175·229	—·08	3·54	+·09	2·52			+·26	0·59	+·13	1·41			+·034	3·8
70	μ κ	4362·951	—·08	5·50	+·19	1·34	+ ·24	0·26	+·31	1·29	—·16	0·90			+·015	8·5
71	z α	4202·502	—·03	3·09	—·06	1·15			—·04	0·88	—·12	0·94			—·049	3·8
72	z w	4699·460	—·16	1·90	—·16	1·66			—·01	0·82	—·07	0·84			—·122	3·3
73	x α	5898·773	+·05	1·58	+·15	0·65	— ·10	0·16	—·23	0·69					+·004	2·85
74	x w	1896·207	—·08	4·22	+·04	2·33			+·09	1·11			+·35	1·66	+·044	6·7
75	k n	5245·191	—·18	0·22	+·09	0·75	+ ·15	0·19	—·26	0·38			+·01	0·32	—·020	1·75
76	k h	1385·581	+·19	2·59	—·02	2·32	— ·25	0·67	—·13	1·16			+·10	0·97	+·030	6·3
77	y α	6052·330	—·03	1·14	—·02	0·62			+·16	0·34			—·29	0·28	—·031	2·2
78	y β	1596·850	+·28	2·39	—·06	2·12	+ ·11	0·63	+·25	0·57			—·07	0·91	+·104	5·6
79	δ η	6443·400	—·32	1·08	—·33	0·58			—·16	0·32			—·55	0·26	—·326	2·1
80	δ α	3006·023	—·02	2·84	+·17	1·27	— ·40	0·40	+·14	1·00			—·01	0·56	+·025	5·2

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TABLE XVIII.—*continued.*

Rotation No.	Stars.	Final Computed Distance.	Cape Observations. Gill.		Cape Observations. Finlay.		Cape Observations. Jacoby.		Yale. Chase.		Göttingen. Schur.		Göttingen. Ambronn.		Mean C—O.	
		′	″	p	″	p	″	p	″	p	″	p	″	p	″	p
81	ει	4476·612	—·29	0·49	—·25	1·30	— ·74	0·25	+·03	0·84			+·24	0·39	—·161	3·1
82	εβ	4014·870	+·04	1·34	+·33	0·97			—·07	0·45			—·07	0·43	+·098	3·0
83	gn	6364·028	—·04	0·90	—·01	0·58			—·59	0·32			—·49	0·27	—·177	1·92
84	gl	4265·696	+·14	1·53	+·60	0·91			+·32	0·44			—·27	0·41	+·236	2·4
85	Em	4915·713	—·19	2·73	+·16	1·60	+ ·03	0·21	+·25	1·18			—·19	0·35	—·002	6·0
86	Ec	6890·039	+·03	1·01	+·30	0·66			—·10	0·60			+·26	0·25	+·092	2·4
87	Fz	5054·101	—·06	1·33	—·26	0·77	+ ·33	0·20	—·12	0·78			—·39	0·35	—·128	3·25
88	Fv	5241·838	—·18	1·74	—·01	1·12			—·17	0·76			—·24	0·33	—·137	3·9
89	sv	3336·517	+·03	2·54	+·39	1·76			+·35	0·96	—·14	0·62			+·169	5·4
90	sr	5718·762	—·05	1·63	+·38	1·02			—·04	0·72	+·57	0·32			+·127	3·5
91	γw	6786·124	+·08	1·36	+·02	0·53	— ·39	0·14	+·32	0·60			+·16	0·25	+·107	2·6
92	nh	6170·524	—·47	0·74	+·34	0·60	— ·05	0·16	—·31	0·33			—·04	0·28	—·122	2·05
93	ac	3763·057	+·16	2·26	+·17	2·08	+ ·27	0·64	—·04	1·15			—·14	0·45	+·115	5·3
94	vu	1237·641	+·02	5·52	—·10	2·46	+ ·02	0·70	—·10	1·18			+·05	1·02	—·016	9·3
95	fm	3651·896	+·05	5·27	—·03	4·34	— ·07	0·68	+·10	1·41	—·14	0·57			+·008	10·8
96	fl	5526·064	+·29	1·68	+·04	1·43			+·09	0·36			—·28	0·30	+·135	2·8
97	pu	7056·139	—·32	0·67	+·26	0·52	+ ·41	0·14					·00	0·25	—·015	1·54
98	po	1317·341	·00	5·36	—·03	2·40	·00	0·69	—·18	1·17	—·23	1·35	—·11	1·00	—·058	8·7
99	qv	5013·854	+·13	3·56	—·15	2·73	+ ·20	0·20	—·03	1·17	—·07	0·39	+·42	0·35	+·025	7·55
100	qm	6731·595	—·03	2·75	—·08	1·88	+ ·23	0·14	—·21	1·22	—·14	0·55			—·086	6·2
101	ek	5504·030	—·14	1·68	—·07	0·71			—·02	0·73	+·38	0·34			—·049	3·0
102	eb	4451·882	—·14	0·99	+·32	0·88	+ ·20	0·26	+·04	0·84	+·09	0·45			+·081	3·1
103	di	5785·060	—·20	0·80	—·44	0·66	+ ·17	0·16			—·06	0·31			—·229	1·5
104	tx	5162·402	—·10	1·74	+·16	1·50	— ·59	0·19	—·04	0·38	+·05	0·37			—·008	3·8
105	λδ	6776·484	+·05	3·06	+·06	0·93	+ ·15	0·14	—·37	0·60	+·45	0·55			+·052	4·6
106	ml	4247·997	+·28	1·02	+·15	0·91	— ·10	0·28	—·29	0·44	—·08	0·47			+·070	2·42
107	zδ	5383·282	+·15	1·70	—·23	0·73	— ·07	0·19	—·18	0·37					+·004	2·3
108	zγ	4064·637	+·20	1·06	+·08	0·96	+ ·19	0·30	—·50	0·45	—·05	0·49			+·027	2·5
109	xγ	6444·042	—·17	0·72	+·10	0·58	+ ·48	0·23	+·28	0·32			—·23	0·26	+·038	2·0
110	ko	3707·611	—·01	1·73	+·43	0·53	+ ·23	0·32	+·26	0·46	—·01	0·56	+·01	0·46	+·100	3·4
111	yδ	7193·459	+·33	0·66	—·09	0·51	+ ·83	0·14							+·219	1·25
112	yw	3594·171	+·18	1·19	+·23	1·10	— ·48	0·34	—·08	0·47			—·03	0·47	+·072	3·0
115	gi	2190·700	—·23	1·87	—·02	1·68	+ ·13	0·53	—·17	0·54			+·06	0·75	—·082	2·9
116	Ei	4314·118	—·01	1·02	+·17	0·91	+ ·32	0·27	—·29	0·43			—·41	0·40	—·021	2·2
117	Fx	3545·292	+·31	1·20	+·16	1·68	+ ·33	0·35	—·22	0·47			—·57	0·48	+·093	3·9
118	su	3010·540	+·03	2·84	—·02	1·27	— ·15	0·40	—·08	1·00	—·08	0·69			—·022	5·5
119	rv	5154·003	—·06	1·74	+·44	0·75	—1·03	0·20	—·15	0·76			+·11	0·33	—·102	3·6
120	wu	3343·846	+·03	2·55	—·45	0·58	+ ·15	0·36	+·06	0·96			—·09	0·51	—·028	4·2
122	fe	2358·319	—·07	6·16	+·06	2·40	— ·04	0·50	—·14	1·59			—·14	0·71	—·056	8·9
124	qw	7231·412	+·05	2·64	+·27	0·51	+ ·08	0·14			—·36	0·27	—·30	0·25	+·031	3·4
125	eh	4373·571	—·07	1·00	+·11	0·89	·00	0·26	+·01	0·43	—·38	0·45			—·045	2·8

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TABLE XVIII.—*continued.*

Rotation No.	Stars.	Final Computed Distance.	Cape Observations. Gill.		Cape Observations. Finlay.		Cape Observations. Jacoby.		Yale. Chase.		Göttingen. Schur.		Göttingen. Ambronn.		Mean C—O.	
		″	″	p	″	p	″	p	″	p	″	p	″	p		p
126	d k	7000·763	·00	0·67	+·11	0·52	+·20	0·14	+·40	0·30	+·43	0·27			+·046	1·8
127	t w	3939·444	+·14	1·62	—·31	0·48	+·20	0·30	+·13	0·45	·00	0·50			+·063	3·0
128	m g	3026·568	+·08	1·41	—·30	1·26	—·13	0·40	+·26	0·50	+·55	0·69			+·043	3·7
129	z β	3026·879	+·27	1·41	—·15	1·26	+·49	0·40	+·36	0·50	—·37	0·69			—·012	3·1
130	x β	4534·787	+·22	0·98	+·24	0·86	—·03	0·24	—·02	0·41			—·24	0·37	+·108	2·7
131	k c	6464·942	+·19	0·71	+·16	0·57			+·37	0·31			+·25	0·26	+·221	1·7
132	y v	5823·259	—·04	1·20	—·31	0·33	—·26	0·16	+·02	0·35					—·092	1·9
133	e η	1598·901	—·01	2·39	+·25	2·12	·00	0·63	—·04	0·57			—·05	0·91	+·067	6·0
134	g o	5803·086	+·05	0·80	·00	0·66	+·04	0·17	+·04	0·35			+·02	0·29	+·025	2·0
135	E h	6076·853			—·13	0·62	+·19	0·16	—·46	0·34			—·61	0·28	—·267	1·4
136	F w	5152·924	—·04	2·62	—·03	0·75	+·12	0·20	—·09	0·77					—·036	3·9
137	r u	3991·078	+·03	1·60	+·17	0·97	—·17	0·30	+·02	0·45			+·02	0·43	+·046	3·5
138	f b	6678·956	+·48	0·69	+·21	0·53	—·47	0·14	+·53	0·30			+·35	0·25	+·322	1·8
139	p r	5048·697	—·34	1·78	+·01	1·17	—·14	0·20	—·06	1·17	+·27	0·39	+·70	0·35	—·070	4·7
140	q u	3889·100	—·08	1·65	—·05	1·00	+·38	0·31	+·01	0·90	+·25	0·50	+·27	0·43	+·039	4·5
141	e m	5819·612	—·02	3·20	—·20	2·31	—·31	0·16	—·20	1·75	—·32	0·62			—·138	6·9
142	d h	6069·776	+·30	1·52	+·26	1·24	+·11	0·16	+·33	0·34	+·39	0·30			+·284	3·2
143	t u	601·775	—·21	1·76	—·06	6·40	—·13	0·80	+·15	1·22	+·01	3·40			—·049	11·1
144	m h	2602·717	+·10	0·41	—·19	1·45	+·21	0·46	—·01	0·52	+·03	0·81			—·036	3·5
145	z η	5138·599	+·31	0·88	—·29	0·76	—·11	0·19	+·47	0·39	·00	0·39			+·081	2·1
146	x u	4572·962	—·04	1·92	+·04	0·84	+·31	0·24	—·24	0·82	+·04	0·43	—·09	0·37	—·037	4·1
147	y ε	4504·656	+·07	0·98	—·01	0·86	—·34	0·25	—·21	0·42			—·16	0·38	—·064	2·7
148	ε α	6038·157	—·13	1·54	+·26	0·63	—·13	0·16	—·27	0·34			+·47	0·28	—·009	2·8
149	g h	814·563	—·13	3·28	—·01	2·91	+·20	0·76	—·06	0·60	—·17	1·60			—·064	6·8
150	E k	6020·077	—·01	0·77	—·01	0·31	—·25	0·16	+·51	0·34			—·19	0·28	+·034	1·8
151	F y	5914·165	+·10	0·78	+·33	0·64	+·53	0·16	+·48	0·34			+·61	0·28	+·327	2·1
152	f o	6795·865	—·13	0·68	+·01	1·06	—·16	0·14	+·51	0·60	+·06	0·27			+·083	2·5
153	p h	5910·509	—·02	0·78	—·06	0·64	—·07	0·16	—·01	0·34			+·81	0·28	+·072	2·1
154	q n	5517·645	—·05	2·52	—·03	1·43	+·24	0·18	—·04	1·08	—·15	0·68			—·051	5·4
155	e g	3560·857	+·18	1·20	—·05	1·11	+·05	0·34	—·28	0·47	—·07	0·59			—·002	3·2
156	d c	2910·765	+·13	2·94	+·11	1·31	+·56	0·41	—·40	1·00	—·04	1·44			+·044	5·3
157	m c	7050·633	+·17	0·67	—·26	0·52	+·64	0·14	+·46	0·30	—·09	0·27			+·099	1·8
158	z v	6640·657	·00	3·14	—·01	1·64	+·45	0·14	+·12	1·55	+·58	0·28	+·11	0·26	+·057	4·3
159	x v	3340·738	—·25	2·52	—·06	1·17	+·18	0·36	+·22	0·97	+·27	0·62	+·10	0·51	—·035	5·5
160	y u	6933·942	+·07	0·67	—·10	0·52	—·09	0·14	+·28	0·30			+·01	0·25	+·039	1·8
161	ε δ	5012·382	—·08	3·11	+·38	1·56	+·63	0·40	+·14	0·39			—·04	0·70	+·103	5·3
162	E g	5741·134	—·16	0·81	—·27	0·67	—·02	0·17	+·19	0·35			—·36	0·29	—·150	2·1
163	F u	6289·293	—·09	1·47	—·13	0·60	—·04	0·16	—·12	0·33			—·00	0·25	—·096	2·8
164	f k	3150·220	—·06	3·38	—·18	2·45	—·12	0·38	—·12	1·47	—·04	1·32			—·102	7·1
165	p i	5001·854	—·02	0·89	+·16	0·78	—·40	0·20	—·34	0·39			—·36	0·35	—·085	1·9
166	E g	2018·006	—·14	4·06	—·19	1·79	+·09	0·57	+·15	1·10	—·25	2·04			—·130	6·9
167	F u	6404·272	—·18	2·52	—·03	1·74	—·13	0·15	—·20	1·28	+·35	0·58			—·090	5·7

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TABLE XVIII.—*continued.*

Rotation No.	Stars.	Final Computed Distance.	Cape Observations. Gill.		Cape Observations. Finlay.		Cape Observations. Jacoby.		Yale. Chase.		Göttingen. Schur.		Göttingen. Ambronn.		Mean C—O.	
				p		p		p		p		p		p		p
168	z y	1890″·544	—″·10	2·11	—″·26	1·86	+″·10	0·59	—″·32	0·55	+″·21	1·07	″	p	—″·091	3·8
169	y η	5320·028	—·05	1·72	—·14	0·74	+ ·42	0·19	—·47	0·75			+·07	0·32	—·120	3·4
170	E f	5042·418	+·22	1·78	+·08	1·94	+ ·14	0·20	+·11	1·17			—·06	0·35	+·123	5·2
171	f h	2049·774	—·13	0·50	+·01	2·64	— ·13	0·57	—·07	0·55	+·04	1·02			—·017	4·85
172	f d	4029·456	—·07	3·20	—·19	1·93	+ ·51	0·30	—·16	0·45	—·08	0·50	+·39	0·43	—·060	5·6
173	p m	3827·938	—·02	4·20	+·08	2·55	— ·21	0·32	+·23	0·92	—·22	0·54	—·35	0·45	—·003	8·2
174	p n	4366·019	—·11	3·50	—·02	2·23			+·08	1·72					—·040	6·7
175	d g	5290·052	—·34	0·86	+·25	0·74	— ·97	0·19			—·04	0·36			—·140	1·95
176	f g	1260·625	+·12·	4·11	+·27·	2·45	— ·33·	0·70	+·04·	0·59			+·17·	1·01	+·131	6·7
177	p g	6574·719	+·29	0·70	—·15	0·55	+ ·56	0·15	—·59	0·31			—·92	0·26	—·111	1·8

Comparison of the Definitive and Observed Position-Angles (Reckoned in Arc on the Great Circle.)

Pair.	Stars.	v C—O	Weight of Observation.	Pair.	Stars.	v C—O	Weight of Observation.
		″				″	
14	θ κ	+0·17	1·6	96	f l	+0·42	0·4
15	λ θ	+ ·03	1·9	100	q m	— ·46	0·5
16	λ κ	— ·14	0·9	105	λ δ	— ·02	1·7
53	f a	+ ·27	0·4	116	E i	+ ·07	0·4
60	d m	— ·08	2·3	122	f e	+ ·01	0·5
65	θ ζ	+ ·22	1·6	124	q w	— ·55	0·8
66	λ μ	+ ·12	2·5	138	f b	— ·26	0·4
67	λ ζ	— ·05	2·2	161	ε δ	— ·03	2·8
70	μ κ	— ·07	3·1	164	f k	— ·35	0·5
71	z α	+ ·14	2·4	170	E f	+ ·09	2·7
81	ε ι	— ·09	1·7	176	f g	+ ·22	0·5
85	E m	+ ·13	2·9	123	Standard Stars	— ·09	8·0
95	f m	— ·27	0·5				

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TABLE XVIII.—*continued.*

COMPARISON OF THE DEFINITIVE RIGHT ASCENSIONS WITH THE MERIDIAN OBSERVATIONS (AFTER THE LATTER HAVE BEEN CORRECTED FOR ERRORS DEPENDING ON MAGNITUDE).

C—O	Final Weight.	Weight from the Meridian Observation.	C—O	Final Weight.	Weight from Meridian Observation.
″			″		
a + ·09	17·0	4·5	u — ·02	30·1	3·7
b — ·07	11·8	3·3	v — ·06	36·0	4·5
c + ·03	19·0	3·1	w + ·07	34·1	5·6
d + ·08	22·4	4·8	x + ·04	30·8	5·3
e — ·01	30·0	4·9	y — ·14	23·8	4·9
f + ·12	38·6	4·8	z + ·03	23·9	4·5
g — ·12	25·0	4·1	α + ·08	19·9	3·1
h + ·02	22·1	3·3	β — ·01	14·7	3·3
i + ·02	18·8	3·8	γ + ·12	18·2	4·2
k + ·02	30·2	4·0	δ — ·06	18·9	4·3
l — ·20	6·1	3·1	ε ·00	21·2	3·9
m + ·03	51·8	4·7	ζ + ·03	12·9	3·6
n — ·08	23·1	3·8	η — ·04	13·1	3·9
o — ·10	20·5	3·1	θ — ·07	18·8	4·1
p — ·02	50·5	7·0	ι + ·16	5·7	3·3
q + ·04	45·8	5·8	κ + ·08	12·5	3·1
r + ·13	16·8	4·0	λ + ·11	16·4	3·0
s — ·03	25·3	3·7	μ — ·01	12·0	6·0
t — ·01	45·5	7·0			

It is unnecessary to repeat the comparison of the definitive and observed declinations, as the differences are identical with the values of y (Table XVI. Column III., pp. 222, 223).

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DETERMINATION OF THE SOLAR PARALLAX, &c.

VOL. I., PART 2.

DISCUSSION

OF THE

OBSERVATIONS OF VICTORIA.

BY

DAVID GILL.

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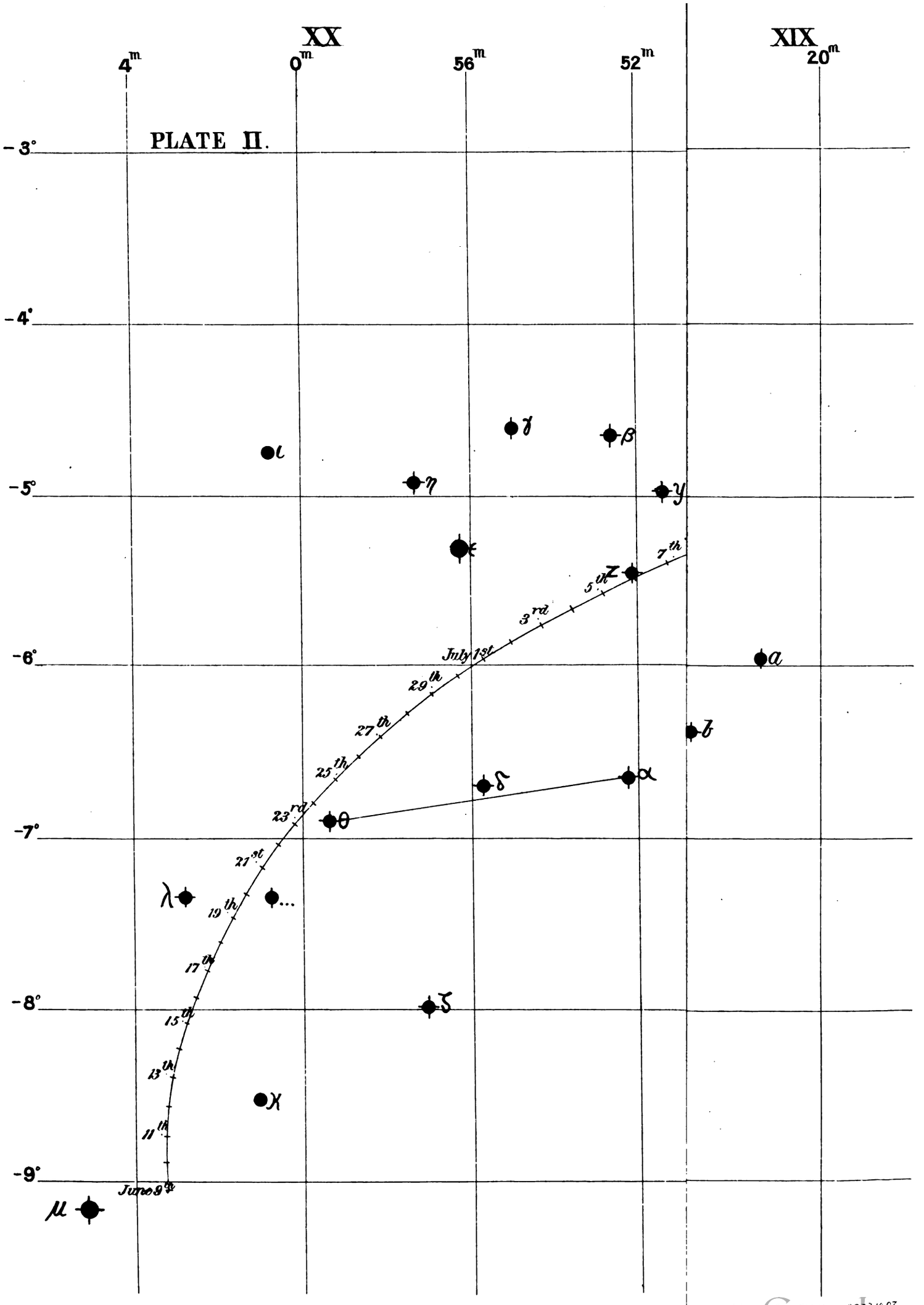

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DISCUSSION OF THE OBSERVATIONS OF VICTORIA.

CHAPTER I.

COMPARISON OF OBSERVED AND TABULAR QUANTITIES. EPHEMERIS I.

Tabular Quantities.

The tabular places of *Victoria* referred to in the subsequent preliminary computations have been interpolated from the following Ephemeris.

The elements of *Victoria* were corrected by Herr H. Lange, of the *Berliner Jahrbuch* office, to represent normal places based on observations near the following epochs:

1874, March 21.	1879, Dec. 2.	1882, Sept. 6.
1875, Oct. 21.	1881, Feb. 27.	1884, Jan. 21.
1878, May 17.	1882, Aug. 13.	1888, Feb. 5.

The corrected elements so found were—

Epoch 1889, June $2^{d}\cdot5$. B.M.T.

M	343°	40′	50″·25		Assumed to osculate June 20·0. B.M.T.
$\pi - \Omega$	66	58	56·49	1889·0	
Ω	235	33	20·84	1889·0	
i	8	22	46·79	1889·0	
ϕ	12	38	19·91		
log. a	0·3682270				
μ	994″·6410				

With these elements the perturbations by *Venus*, the *Earth*, *Mars*, *Jupiter* and *Saturn*, from 1889 May 21 to 1889 October 28, were computed for every 20th day. The resulting Ephemeris is published in the *Astronomische Nachrichten*, No. 2931. From a comparison of this Ephemeris with meridian observations of *Victoria* in 1889, Dr. Auwers deduced 14 normal corrections extending from June 7 to September 19. To these were added 2 normal corrections derived from observations made in

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October 1889, and compared with a continuation of the same Ephemeris. By the solution of the 16 pairs of normal equations thus derived, Dr. Bohlin obtained the following elements :

M	343°	41′	9″·53	
μ	66	59	2·76	1889·0
☊	235	33	1·57	1889·0
i	8	22	49·59	1889·0
ϕ	12	38	32·62	
log. a	0·3682728			
μ	994″·4831			

Osculating for Epoch : 1889, June 20·0 B.M.T.

From these elements an Ephemeris was computed by Dr. Bohlin, including the values of the perturbations, but excluding the small terms in the nutation depending on 2 ☽. The R.A. and Declination were computed for every second day and interpolated for the intermediate days. [Seven-figure logarithms and numbers were used in the computation.]

Although Dr. Bohlin's Ephemeris represents the apparent path of *Victoria* at the opposition of 1889 much more closely than Herr Lange's, yet the elements from which the former has been computed are based on observations extending over so small a portion of the planet's orbit that they must chiefly be regarded as a species of interpolation-formula for the representation of the observations during the opposition of 1889. But Herr Lange's elements, as such, must represent more nearly the true elements of the planet, and the values of log. Δ have been accordingly taken from the latter Ephemeris for the computation of the tabular parallax.

The adopted tabular value of the Sun's Mean Equatorial Horizontal Parallax is 8″·80.

The compression of the Earth has been assumed, according to Colonel Clarke, $\frac{1}{293 \cdot 5}$.

The adopted positions of the Heliometer Observatories are :—

	Longitude.*	Geographical Latitude.	Geocentric Latitude.	Log. radius.
	h m s	° ′	° ′	
Cape ...	0 20 20 E.	− 33 56·1	− 33 45·2	9·99954
Yale ...	5 45 16 W.	+ 41 18·6	+ 41 7·0	9·99935
Leipzig ...	0 4 1 W.	+ 51 20·1	+ 51 8·6	9·99910
Göttingen ...	0 13 49 W.	+ 51 31·8	+ 51 20·4	9·99910
Bamberg ...	0 10 2 W.	+ 49 53·1	+ 49 41·5	9·99914

* Referred to Berlin.

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Ephemeris of Victoria.

For $12^{h}\cdot0$ Berlin Mean Time.

1889.	α	1st Difference.	2nd Difference.	δ	1st Difference.	2nd Difference.	Log. Δ	Diff.	Aberr. Time.
	h m s	s	s	° ′ ″	′ ″	″		′	m s
June 9	20 3 14·289		— 2·088	— 9 2 59·12		— 5·62	9·987883	—3116	8 4
		+ 0·350			+ 9 55·77				
10	3 14·639		— 2·083	— 8 53 3·35		— 5·97	9·984807	—3076	8 1
		— 1·733			+ 9 49·80				
11	3 12·906		— 2·082	— 8 43 13·55		— 6·33	9·981772	—3035	7 57
		— 3·815			+ 9 43·47				
12	3 9·091		— 2·079	— 8 33 30·08		— 6·66	9·978780	—2992	7 54
		— 5·894			+ 9 36·81				
13	3 3·197		— 2·076	— 8 23 53·27		— 7·04	9·975833	—2947	7 51
		— 7·970			+ 9 29·77				
14	2 55·227		— 2·072	— 8 14 23·50		— 7·45	9·972934	—2899	7 48
		— 10·042			+ 9 22·32				
15	2 45·185		— 2·059	— 8 5 1·18		— 7·82	9·970084	—2850	7 45
		— 12·101			+ 9 14·50				
16	2 33·084		— 2·049	— 7 55 46·68		— 8·21	9·967285	—2799	7 42
		— 14·150			+ 9 6·29				
17	2 18·934		— 2·031	— 7 46 40·39		— 8·64	9·964540	—2745	7 39
		— 16·181			+ 8 57·65				
18	2 2·753		— 2·016	— 7 37 42·74		— 9·07	9·961852	—2688	7 36
		— 18·197			+ 8 48·58				
19	1 44·556		— 1·992	— 7 28 54·16		— 9·49	9·959222	—2630	7 33
		— 20·189			+ 8 39·09				
20	1 24·367		— 1·964	— 7 20 15·07		— 9·88	9·956652	—2570	7 30
		— 22·153			+ 8 29·21				
21	1 2·214		— 1·932	— 7 11 45·86		— 10·30	9·954145	—2507	7 28
		— 24·085			+ 8 18·91				
22	0 38·129		— 1·892	— 7 3 26·95		— 10·70	9·951704	—2441	7 25
		— 25·977			+ 8 8·21				
23	0 12·152		— 1·852	— 6 55 18·74		— 11·13	9·949331	—2373	7 23
		— 27·829			+ 7 57·08				
24	19 59 44·323		— 1·807	— 6 47 21·66		— 11·53	9·947029	—2302	7 21
		— 29·636			+ 7 45·55				
25	59 14·687		— 1·755	— 6 39 36·11		— 11·88	9·944800	—2229	7 18
		— 31·391			+ 7 33·67				
26	58 43·296		— 1·695	— 6 32 2·44		— 12·23	9·942646	—2154	7 16
		— 33·086			+ 7 21·44				
27	58 10·210		— 1·640	— 6 24 41·00		— 12·65	9·940570	—2076	7 14
		— 34·726			+ 7 8·79				
28	57 35·484		— 1·578	— 6 17 32·21		— 13·02	9·938573	—1997	7 12
		— 36·304			+ 6 55·77				
29	56 59·180		— 1·512	— 6 10 36·44		— 13·34	9·936658	—1915	7 10
		— 37·816			+ 6 42·43				
30	56 21·364		— 1·444	— 6 3 54·01		— 13·65	9·934827	—1831	7 8
		— 39·260			+ 6 28·78				
July 1	55 42·104		— 1·363	— 5 57 25·23		— 13·97	9·933082	—1745	7 7
		— 40·623			+ 6 14·81				
2	55 1·481		— 1·284	— 5 51 10·42		— 14·23	9·931425	—1657	7 5
		— 41·907			+ 6 0·58				
3	54 19·574		— 1·206	— 5 45 9·84		— 14·52	9·929858	—1567	7 4
		— 43·113			+ 5 46·06				
4	53 36·461		— 1·127	— 5 39 23·78		— 14·76	9·928382	—1476	7 2
		— 44·240			+ 5 31·30				
5	52 52·221		— 1·037	— 5 33 52·48		— 15·00	9·926999	—1383	7 1
		— 45·277			+ 5 16·30				
6	52 6·944		— 0·951	— 5 28 36·18		— 15·19	9·925711	—1288	7 0
		— 46·228			+ 5 1·11				
7	51 20·716		— 0·861	— 5 23 35·07		— 15·38	9·924518	—1193	6 58
		— 47·089			+ 4 45·73				
8	50 33·627		— 0·776	— 5 18 49·34		— 15·54	9·923422	—1096	6 57
		— 47·865			+ 4 30·19				
9	49 45·762		— 0·686	— 5 14 19·15		— 15·66	9·922424	— 998	6 56
		— 48·551			+ 4 14·53				
10	48 57·211		— 0·599	— 5 10 4·62		— 15·78	9·921525	— 899	6 55
		— 49·150			+ 3 58·75				
11	48 8·061		— 0·511	— 5 6 5·87		— 15·91	9·920726	— 799	6 55
		— 49·661			+ 3 42·84				
12	47 18·400		— 0·423	— 5 2 23·03		— 16·01	9·920027	— 699	6 54
		— 50·084			+ 3 26·83				
13	46 28·316		— 0·330	— 4 58 56·20		— 16·09	9·919429	— 598	6 53
		— 50·414			+ 3 10·74				
14	45 37·902		— 0·238	— 4 55 45·46		— 16·09	9·918934	— 495	6 53
		— 50·652			+ 2 54·65				
15	44 47·250		— 0·142	— 4 52 50·81		— 16·21	9·918541	— 393	6 53
		— 50·794			+ 2 38·44				
16	43 56·456		— 0·047	— 4 50 12·37		— 16·25	9·918252	— 289	6 52
		— 50·841			+ 2 22·19				
17	43 5·615		+ 0·055	— 4 47 50·18		— 16·22	9·918066	— 186	6 52
		— 50·786			+ 2 5·97			— 82	

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EPHEMERIS OF VICTORIA—*continued.*

1889.	α	1st Difference.	2nd Difference.	δ	1st Difference.	2nd Difference.	Log. Δ	Diff.	Aberr. Time.
	h m s	s	s	° ′ ″	′ ″	″			m s
July 18	19 42 14·829		+ 0·158	— 4 45 44·21		— 16·12	9·917984		6 52
		— 50·629			+ 1 49·85			+ 22	
19	41 24·201		+ 0·261	— 4 43 54·36		— 16·13	9·918006		6 52
		— 50·367			+ 1 33·72			+ 126	
20	40 33·834		+ 0·363	— 4 42 20·64		— 16·07	9·918132		6 52
		— 50·004			+ 1 17·65			+ 231	
21	39 43·830		+ 0·466	— 4 41 2·99		— 15·91	9·918363		6 52
		— 49·538			+ 1 1·74			+ 334	
22	38 54·292		+ 0·567	— 4 40 1·25		— 15·71	9·918697		6 53
		— 48·971			+ 0 46·03			+ 437	
23	38 5·321		+ 0·670	— 4 39 15·22		— 15·53	9·919134		6 53
		— 48·301			+ 0 30·50			+ 540	
24	37 17·020		+ 0·771	— 4 38 44·72		— 15·30	9·919674		6 54
		— 47·530			+ 0 15·20			+ 642	
25	36 29·490		+ 0·872	— 4 38 29·52		— 15·11	9·920316		6 54
		— 46·658			+ 0 0·09			+ 743	
26	35 42·832		+ 0·973	— 4 38 29·43		— 14·87	9·921059		6 55
		— 45·685			— 0 14·78			+ 843	
27	34 57·147		+ 1·067	— 4 38 44·21		— 14·55	9·921902		6 56
		— 44·618			— 0 29·33			+ 941	
28	34 12·529		+ 1·156	— 4 39 13·54		— 14·19	9·922843		6 57
		— 43·462			— 0 43·52			+1039	
29	33 29·067		+ 1·246	— 4 39 57·06		— 13·82	9·923882		6 58
		— 42·216			— 0 57·34			+1135	
30	32 46·851		+ 1·334	— 4 40 54·40		— 13·41	9·925017		6 59
		— 40·882			— 1 10·75			+1229	
31	32 5·969		+ 1·414	— 4 42 5·15		— 13·09	9·926246		7 0
		— 39·468			— 1 23·84			+1322	
Aug. 1	31 26·501		+ 1·489	— 4 43 28·99		— 12·78	9·927568		7 1
		— 37·979			— 1 36·62			+1412	
2	30 48·522		+ 1·566	— 4 45 5·61		— 12·25	9·928980		7 3
		— 36·413			— 1 48·87			+1500	
3	30 12·109		+ 1·639	— 4 46 54·48		— 11·77	9·930480		7 4
		— 34·774			— 2 0·64			+1587	
4	29 37·335		+ 1·701	— 4 48 55·12		— 11·34	9·932067		7 6
		— 33·073			— 2 11·98			+1672	
5	29 4·262		+ 1·754	— 4 51 7·10		— 10·92	9·933739		7 7
		— 31·319			— 2 22·90			+1754	
6	28 32·943		+ 1·806	— 4 53 30·00		— 10·44	9·935493		7 9
		— 29·513			— 2 33·34			+1834	
7	28 3·430		+ 1·852	— 4 56 3·34		— 9·98	9·937327		7 11
		— 27·661			— 2 43·32			+1912	
8	27 35·769		+ 1·895	— 4 58 46·66		— 9·53	9·939239		7 13
		— 25·766			— 2 52·85			+1987	
9	27 10·003		+ 1·934	— 5 1 39·51		— 9·07	9·941226		7 15
		— 23·832			— 3 1·92			+2061	
10	26 46·171		+ 1·973	— 5 4 41·43		— 8·65	9·943287		7 17
		— 21·859			— 3 10·57			+2132	
11	26 24·312		+ 2·004	— 5 7 52·00		— 8·19	9·945419		7 19
		— 19·855			— 3 18·76			+2202	
12	26 4·457		+ 2·039	— 5 11 10·76		— 7·73	9·947621		7 21
		— 17·816			— 3 26·49			+2269	
13	25 46·641		+ 2·069	— 5 14 37·25		— 7·24	9·949890		7 24
		— 15·747			— 3 33·73			+2334	
14	25 30·894		+ 2·099	— 5 18 10·98		— 6·85	9·952224		7 26
		— 13·648			— 3 40·58			+2398	
15	25 17·246		+ 2·121	— 5 21 51·56		— 6·40	9·954622		7 28
		— 11·527			— 3 46·98			+2458	
16	25 5·719		+ 2·145	— 5 25 38·54		— 5·99	9·957080		7 31
		— 9·382			— 3 52·97			+2518	
17	24 56·337		+ 2·163	— 5 29 31·51		— 5·50	9·959598		7 34
		— 7·219			— 3 58·47			+2575	
18	24 49·118		+ 2·183	— 5 33 29·98		— 5·17	9·962173		7 36
		— 5·036			— 4 3·64			+2629	
19	24 44·082		+ 2·202	— 5 37 33·62		— 4·51	9·964802		7 39
		— 2·834			— 4 8·15			+2682	
20	24 41·248		+ 2·216	— 5 41 41·77		— 4·15	9·967484		7 42
		— 0·618			— 4 12·30			+2733	
21	24 40·630		+ 2·229	— 5 45 54·07		— 3·69	9·970217		7 45
		+ 1·611			— 4 15·99			+2781	
22	24 42·241		+ 2·238	— 5 50 10·06		— 3·25	9·972998		7 48
		+ 3·849			— 4 19·24			+2828	
23	24 46·090		+ 2·242	— 5 54 29·30		— 2·82	9·975826		7 51
		+ 6·091			— 4 22·06			+2872	
24	24 52·181		+ 2·246	— 5 58 51·36		— 2·36	9·978698		7 54
		+ 8·337			— 4 24·42			+2915	
25	25 0·518		+ 2·245	— 6 3 15·78		— 1·91	9·981613		7 57
		+ 10·582			— 4 26·33			+2955	
26	25 11·100		+ 2·245	— 6 7 42·11		— 1·51	9·984568		8 0
		+ 12·827			— 4 27·84			+2993	
27	25 23·927		+ 2·240	— 6 12 9·95		— 1·11	9·987561		8 4
		+ 15·067			— 4 28·95			+3029	
28	25 38·994		+ 2·233	— 6 16 38·90		— 0·66	9·990590		8 7
		+ 17·300			— 4 29·61			+3063	
29	25 56·294		+ 2·220	— 6 21 8·51		— 0·22	9·993653		8 11

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OBSERVED QUANTITIES.

Results of Observations of the Standard Stars.

The constants required for correcting the observations of single distances and position-angles depend upon observations of the Standard Stars.

The details of the instrumental observations will be found in Vol. II., Part I.; the reduced results are given in the Tables on pp. 254–262.

Distances.

In the following Tables the column marked "correction to Σ" means the correction of the observed standard distance to the known Standard Distance, viz., 6456″·52.

The last column, marked $\Delta\sigma$, gives the corresponding correction for 1000″ of distance, which is applicable to all observations of *single* distances that are measured by the same observer about the same epoch as the Standard Stars; the application of these corrections is dealt with in chapter II.

Position-Angles.

The column marked "Correction for Instrumental Adjustment" is derived as follows for the various Observatories.

Cape Position-Angles.

From observations on 1889 July 17 and August 7, the following values of the constants of the instrumental adjustment (Chauvenet's notation) were deduced—

$$\xi = +\ 24''\cdot8\ ;\ \eta + 23''\cdot9\ ;\ e + 5''\cdot2\ ;\ i = +\ 11''\cdot3\ ;\ c = -\ 9''\cdot4$$

ϵ was assumed $= -\ 59''\cdot4$ in accordance with the result of special observations made 1889 March 5, and ψ (Bessel's μ) $= \pm\ 21''\cdot2$ from observations on 16 nights in Nov. and Dec. 1889. (*See* Triangulation, Chap. VIII., p. 162). Therefore the correction to any observed angle is:—

$$* \left\{ \begin{array}{l} -\ 35'\ 43'' \pm 21''\cdot2\ (-\sin\phi\cos\delta + \cos\phi\sin\delta\cos\tau) + 24''\cdot8\sin\tau\sec\delta \\ \qquad -\ 23''\cdot9\cos\tau\sec\delta \pm 21''\cdot8\sec\delta \mp 9''\cdot4\tan\delta \\ \qquad -\ 5''\cdot2\cos\phi\tan\delta\sin\tau \end{array} \right.$$

Practically for *Victoria* we have, for all Declinations,

Hour-Angle τ.	Correction for Index-Error.	Hour-Angle τ.	Correction for Index-Error.	
h	′ ″	h	′ ″	
− 0	− 35 34	+ 0	− 36 40	For Eastern hour-angles the Tube was always *preceding*; for Western hour-angles always *following*.
1	35 40	1	36 33	
2	35 43	2	36 25	
3	35 44	3	36 16	
4	35 43	4	36 7	
5	35 40	5	35 59	

* The upper sign applies to "Tube *preceding*," the lower to "Tube *following*."

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Yale Position-Angles.

Dr. Elkin gives the following Tables for correcting the Index-Error on account of the Instrumental Position and Flexure.

Hour-Angle τ.	Declination 0°.		Declination — 10°.		Correction for Index-Error.
	Tube West.	Tube East.	Tube West.	Tube East.	
h m	″	″	″	″	
— 3 0	— 43	...	— 42	...	
— 2 30	— 31	...	— 30	...	
— 2 0	— 20	...	— 18	...	
— 1 30	— 6	...	— 7	...	
— 1 0	+ 6	+ 87	+ 5	+ 87	
— 0 30	+ 17	+ 95	+ 16	+ 98	
0 0	+ 27	+ 105	+ 26	+ 108	
+ 0 30	+ 35	+ 113	+ 34	+ 116	+ 90°
+ 1 0	+ 44	+ 122	+ 43	+ 125	— 50″
+ 1 30	...	+ 126	...	+ 130	
+ 2 0	...	+ 132	...	+ 133	
+ 2 30	...	+ 135	...	+ 135	
+ 3 0	...	+ 137	...	+ 137	

Leipzig Position-Angles.

From Dr. Peter's observations of the Standard Stars the following Tables of requisite corrections, on account of Index-Error, Instrumental Position, and Flexure, have been deduced by a graphical process.

Hour-Angle τ.	G. F.	G. V.
	Counterpoise following.	Counterpoise preceding.
h m	° ′ ″	° ′ ″
— 3 0	+ 91 — 3 40	+ 91 — 0 19
— 2 30	3 30	0 13
— 2 0	3 20	0 7
— 1 30	3 8	— 0 2
— 1 0	2 55	+ 0 5
— 0 30	2 43	0 11
0 0	2 30	0 17
+ 0 30	2 18	0 26
+ 1 0	2 7	0 43
+ 1 30	1 55	0 55
+ 2 0	1 44	+ 1 12
+ 2 30	— 1 33	

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Göttingen Position-Angles.

The constants of the Equatorial adjustments as determined by Dr. Schur are, in Chauvenet's notation:

$$\xi = -17''; \quad \eta = -76''; \quad c = -1''; \quad i = +60''; \quad \epsilon = \pm 54''$$
$$\text{whence } i_1 = i - \epsilon \sin \phi = +18''$$

The value of e was not determined, its effect is probably quite insensible for objects near the equator.

By revolving the telescope on its Declination-axis when directed towards a horizontal Collimator, with tube both E. and W. of the pier, the mean value of the zero-reading of the Position-circle was found to be 359° 59′ 33″; and $\psi = 7''$.

The total preliminary correction applicable to observed position-angles is thus:—

$$\left\{ \begin{array}{l} +27'' \pm 7''(-\sin\phi\cos\delta + \cos\phi\sin\delta\cos\tau) - 17''\sin\tau\sec\delta \\ \qquad + 76''\cos\tau\sec\delta \pm 18''\sec\delta \mp 1''\tan\delta \end{array} \right.$$

The upper sign to be used for $\left\{ \begin{array}{c} \text{Axis following} \\ \text{Tube West} \end{array} \right\}$, the lower for $\left\{ \begin{array}{c} \text{Axis preceding} \\ \text{Tube East} \end{array} \right\}$.

The corresponding corrections are:—

Hour-Angle.	Axis following / Tube preceding.		Axis preceding. / Tube following.	
τ	Decl. — 4°	Decl. — 9°	Decl. — 4°	Decl. — 9°
h m	′ ″	′ ″	′ ″	′ ″
— 3 0	+ 1 45	+ 1 46	...	...
— 2 0	1 54	1 54	+ 1 29	+ 1 30
— 1 0	1 57	1 58	1 33	1 34
0 0	1 55	1 56	1 31	1 32
+ 1 0	1 47	1 48	1 24	1 25
+ 2 0	+ 1 37	+ 1 37	1 12	1 13
+ 3 0	...	...	0 57	+ 0 57
+ 4 0	...	...	+ 0 38	...

The observations of the Standard Stars appear to show, however, that the true value of ψ is much greater than 7″.

Bamberg Position-Angles.

No data have been communicated relative to the Equatorial adjustments or flexure. The single position-angles have been finally corrected by the observations of position-angle of the Standard Stars, and the definite Index-Error of the double position-angles from the observations of opposite stars. A general correction of + 89° 50′ has been applied in computing the instrumental position-angles.

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In the following Tables of the "Results of Observations of the Standard Stars in Position-Angle" the corrections for Index-Error combined with error of Equatorial adjustment and Flexure are taken from the preceding Tables and entered in the column marked "Correction for Instrumental Adjustment."

In the subsequent "Observed Position-Angles" of the planet (Tables F, G, H, I, K, of present chapter) these corrections, from want of space, are not given separately; the "Observed Position-Angles" of these Tables are formed by adding to the "Instrumental Position-Angles" of Vol. II., Part I., the corresponding corrections for Index-Error, &c.

The column marked Δp gives the correction required to reduce the *observed* position-angle of the Standard Stars (after all known corrections have been applied) to the *known* position-angle, viz., 277° 11′ 54″.

This correction Δp is *not* applied to the results given in the Tables, F, G, H, I, K, but is employed in finally correcting the absolute terms in the equations (*see* Chapter III). [When Δp is thus determined in the same set before and after the observations of the planet, the mean of the two values of Δp is adopted.]

RESULTS OF OBSERVATIONS OF STANDARD STARS IN DISTANCE.—CAPE.

Rotation No.	Date.	Sidereal Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ.	Δσ.	Adopted value of Δσ.
	1889	h m		″	″	″	″	″	″	″
42	June 19	16 38·5	G	6453·122	3·005	+·284	6456·411	+0·107	+·017	+0·017
52	21	18 2·4	G	53·721	2·078	+·264	6·063	+0·455	+·071	+ ·071
53	22	16 2·4	A	53·285	4·195	+·254	7·734	−1·216	−·188	} − ·113
62	22	17 50·6	A	54·374	2·136	+·254	6·764	−0·246	−·038	
71	23	16 23·9	G	52·974	3·439	+·244	6·657	−0·139	−·022	} + ·025
79	23	18 39·2	G	53·927	1·892	+·244	6·063	+0·455	+·071	
80	25	22 13·4	A	53·142	3·060	+·225	6·427	+0·091	+·014	} − ·013
87	25	23 27·2	A	50·610	5·942	+·225	6·777	−0·259	−·040	
217	July 5	17 3·7	G	53·712	2·632	+·128	6·472	+0·046	+·007	} + ·035
226	5	18 47·3	G	54·111	1·873	+·128	6·112	+0·406	+·063	
235	5	0 19·7	A	43·152	13·414	+·128	6·694	−0·176	−·027	− ·027
252	10	16 42·9	A	53·433	3·008	+·078	6·519	−0·001	·000	} + ·024
253	10	16 58·2	A	53·398	2·735	+·078	6·211	+0·307	+·048	
313	18	17 7·3	A	54·205	2·595	−·003	6·797	−0·279	−·043	− ·043
316	18	23 2·7	G	51·959	4·602	−·003	6·558	−0·040	−·006	− ·006
357	20	16 58·4	A	54·195	2·734	−·024	6·905	−0·387	−·060	− ·060
371	20	23 25·5	G	50·018	6·003	−·024	5·997	+0·521	−·081	− ·081
384	21	16 25·3	G	52·485	3·429	−·034	5·880	+0·638	+·099	+ ·099
395	21	23 13·2	A	51·459	5·233	−·034	6·658	−0·140	−·022	− ·022
412	22	16 27·2	A	53·755	3·361	−·044	7·072	−0·554	−·086	− ·086

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Results of Observations of Standard Stars in Distance.—Cape—*continued.*

Rotation No.	Date.	Sidereal Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ.	Δσ.	Adopted value of Δσ.
	1889	h m		″	″	″	″	″	″	″
423	July 22	0 6·9	G	6446·733	10·557	—·044	6457·246	—0·728	—·113	—0·113
481	25	17 45·0	G	54·028	2·169	—·074	6·123	+0·395	+·061	+ ·061
500	26	15 59·7	A	52·562	4·289	—·084	6·767	—0·249	—·039	— ·039
509	26	23 3·0	G	51·385	4·615	—·084	5·916	+0·602	+·093	+ ·093
515	27	16 26·1	G	53·088	3·402	—·095	6·395	+0·123	+·019	+ ·019
527	27	22 41·5	A	52·342	3·809	—·095	6·056	+0·462	+·072	+ ·072
574	31	23 11·0	A	51·497	4·951	—·135	6·313	+0·205	+·032	+ ·032
617	Aug. 5	16 31·7	A	54·181	3·285	—·186	7·280	—0·762	—·118	— ·068
618	5	16 37·3	A	53·669	3·150	—·186	6·633	—0·115	—·018	
633	6	16 38·8	G	53·314	3·111	—·195	6·230	+0·288	+·045	+ ·045
650	6	22 52·5	A	52·576	4·265	—·195	6·646	—0·128	—·020	— ·020
667	7	16 7·5	A	52·576	3·986	—·204	6·358	+0·160	+·025	+ ·025
700	8	17 20·0	G	54·287	2·395	—·214	6·468	+0·050	+·008	+ ·008
726	9	16 24·1	A	53·957	3·417	—·223	7·151	—0·633	—·098	— ·098
784	12	17 17·7	G	53·368	2·379	—·252	5·495	+1·023	+·159	+ ·159
796	16	16 50·2	G	53·431	2·839	—·288	5·982	+0·536	+·083	+ ·083
817	16	23 46·4	A	49·447	7·681	—·288	6·840	—0·322	—·050	— ·050
851	20	22 30·6	A	53·790	3·433	—·324	6·899	—0·381	—·059	— ·059
874	22	17 37·1	G	54·043	2·177	—·341	5·879	+0·639	+·099	+ ·099
887	22	22 42·2	A	53·576	3·739	—·341	6·974	—0·456	—·071	— ·071
893	23	16 37·8	A	53·554	3·024	—·350	6·228	+0·290	+·045	+ ·045
907	23	22 27·6	G	53·522	3·358	—·350	6·530	—0·012	—·002	— ·002
923	24	22 47·6	A	49·947	7·743	—·359	7·331	—0·813	—·126	— ·126
938	26	22 28·3	A	6453·165	3·412	—·374	6456·203	+0·315	+·049	+0·049

Results of Observations of Standard Stars in Distance.—Yale.

Rotation No.	Date.	Berlin Mean Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ.	Δσ
	1889.			r	r	″	″	″	″
17	June 20	·71215	E	508·840	0·260	+0·27	6456·43	+ 0·09	—0·058
27	20	·74139	E	8·976	·198	+ ·27	7·37	— ·85	
30	20	·76767	H	9·143	·166	+ ·27	7·85	— 1·33	— ·127
44	20	·83036	H	9·088	·140	+ ·27	6·82	— ·30	
70	23	·74695	E	8·973	·182	+ ·24	7·10	— ·58	— ·146
88	23	·78557	E	9·061	·151	+ ·24	7·82	— 1·30	
90	23	·84988	H	9·194	·149	+ ·24	8·25	— 1·73	— ·268
159	July 5	·82891	H	9·100	·154	+ ·13	7·01	— ·49	— ·076

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RESULTS OF OBSERVATIONS OF STANDARD STARS IN DISTANCE.—YALE—*continued.*

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ.	Δσ
	1889.				r	r	″	″	″	″
161	July	6	·67545	E	508·984	0·242	+0·12	6457·88	— 1·36	—0·210
191		6	·77025	H	9·138	·143	+ ·12	7·34	— ·82	— ·127
193		7	·64787	H	8·969	·322	+ ·11	7·46	— ·94	— ·147
207		7	·73376	H	9·138	·154	+ ·11	7·47	— ·95	
209		7	·74280	E	8·985	·149	+ ·11	6·70	— ·18	— ·064
223		7	·77884	E	9·030	·140	+ ·11	7·16	— ·64	
225		12	·63738	H	8·885	·308	+ ·06	6·17	+ ·35	— ·105
237		12	·72598	H	9·216	·140	+ ·06	8·24	— 1·72	
239		12	·73602	E	9·007	·146	+ ·06	6·89	— ·37	— ·027
253		12	·79392	E	8·980	·143	+ ·06	6·51	+ ·01	
255		15	·62740	H	8·931	·318	+ ·03	6·85	— ·33	— ·074
275		15	·68417	H	9·089	·183	+ ·03	7·14	— ·62	
277		15	·73821	E	8·981	·145	+ ·03	6·52	·00	— ·010
291		15	·77100	E	8·995	·142	+ ·03	6·66	— ·14	
300		16	·67150	E	8·975	·194	+ ·02	7·06	— ·54	— ·084
317		16	·80993	H	9·159	·160	+ ·02	7·72	— 1·20	— ·186
325		17	·63605	H	9·132	·268	+ ·01	8·74	— 2·22	— ·198
339		17	·68688	H	9·080	·171	+ ·01	6·85	— ·33	
349		17	·78373	E	9·007	·145	+ ·01	6·83	— ·31	— ·048
359		18	·63668	E	8·871	·256	·00	6·50	+ ·02	— ·032
377		18	·68218	E	8·919	·175	·00	6·09	+ ·43	
379		18	·75930	H	9·081	·140	·00	6·46	+ ·06	— ·091
401		18	·83773	H	9·118	·205	·00	7·76	— 1·24	
403		20	·64599	E	8·901	·216	— ·02	6·36	+ ·16	+ ·024
417		21	·61399	H	8·999	·302	— ·03	7·45	— ·93	— ·086
435		21	·68047	H	9·074	·168	— ·03	6·70	— ·18	
437		21	·77508	E	9·022	·146	— ·03	6·99	— ·47	— ·066
455		21	·81015	E	8·987	·174	— ·03	6·90	— ·38	
457		22	·62682	E	9·064	·251	— ·04	8·85	— 2·33	— ·257
475		22	·66804	E	9·036	·176	— ·04	7·54	— 1·02	
513		25	·60310	H	9·016	·307	— ·07	7·69	— 1·17	— ·087
535		25	·67041	H	9·060	·168	— ·07	6·48	+ ·04	
537		25	·75401	E	9·133	·144	— ·07	8·34	— 1·82	— ·172
551		25	·79094	E	9·000	·167	— ·07	6·94	— ·42	
595	August	5	·62276	E	9·005	·188	— ·18	7·16	— ·64	— ·099
605		5	·64087	E	8·905	...	...	...	...	
639		8	·71861	E	8·990	·145	— ·21	6·39	+ ·13	+ ·029
641		8	·72239	E	8·980	·146	— ·21	6·28	+ ·24	
683		16	·58296	E	8·995	·202	— ·29	7·10	— ·58	— ·050
685		16	·58647	E	8·961	·196	— ·29	6·59	— ·07	
695		16	·73431	E	9·016	·169	— ·29	6·95	— ·43	— ·055
697		16	·73713	E	9·000	·173	— ·29	6·80	— ·28	
745		22	·72215	E	9·023	·173	— ·34	7·04	— ·52	—0·095
747		22	·72528	E	509·034	0·177	—0·34	6457·23	— ·71	

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Results of Observations of Standard Stars in Distance.—Leipzig.

Rotation No.	Date.	Berlin Mean Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ	Δσ	Adopted value of Δσ
	1889			″	″	″	″	″	″	″
29	June 20	·43794	P	6449·964	6·336	+·254	6456·554	—·036	—·069	—·069
37	20	·57123	P	54·283	2·835	+·254	7·372	—·854		
55	24	·55078	P	54·268	1·892	+·235	6·395	+·123	+·019	+·019
69	25	·56268	P	54·638	1·821	+·226	6·685	—·167	—·018	—·018
71	25	·58518	P	54·591	1·771	+·226	6·588	—·070		
101	July 7	·43133	P	53·049	3·482	+·108	6·639	—·121	—·019	—·019
144	31	·34926	P	52·612	4·374	—·135	6·851	—·333	—·052	—·006
151	31	·42368	P	54·234	2·146	—·135	6·245	+·273	+·042	
154	31	·50407	P	54·891	1·811	—·135	6·567	—·049	—·008	
166	Aug. 7	·49984	P	55·034	1·851	—·204	6·681	—·163	—·025	—·025
184	12	·46908	P	55·245	1·774	—·251	6·768	—·250	—·039	—·003
187	12	·51065	P	54·478	2·069	—·251	6·296	+·222	+·034	
192	16	·48850	P	54·875	1·966	—·288	6·553	—·035	—·005	—·026
195	16	·51724	P	54·717	2·390	—·288	6·819	—·301	—·047	
215	20	·36064	P	54·873	2·214	—·324	6·763	—·245	—·038	—·034
216	20	·36883	P	54·922	2·105	—·324	6·703	—·185	—·029	
218	25	·42890	P	54·958	1·783	—·366	6·375	+·143	+·021	

Results of Observations of Standard Stars in Distance.—Göttingen.

Rotation No.	Date.	Berlin Mean Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ	Δσ
	1889			″	″	″	″	″	″
8	June 20	·57009	S	6455·050	1·887	+·274	6457·211	—0·693	—·107
25	24	·53924	S	4·599	2·072	+·235	6·906	— ·388	—·060
31	25	·53757	S	4·450	2·049	+·225	6·724	— ·206	—·032
55	July 10	·60868	S	4·786	2·028	+·078	6·892	— ·374	—·058
65	31	·52702	S	5·413	1·878	—·135	7·156	— ·638	—·072
67	31	·58625	S	4·028	2·909	—·135	6·802	— ·284	
79	August 5	·50445	S	5·377	1·779	—·184	6·972	— ·454	—·070
86a	8	·57889	S	3·436	3·543	—·213	6·766	— ·248	—·038
99	16	·55153	S	4·189	3·243	—·288	7·144	— ·626	—·097
106	20	·39722	S	5·211	1·887	—·324	6·774	— ·256	—·040

Results of Observations of Standard Stars in Distance.—Bamberg.

Rotation No.	Date.	Berlin Mean Time.	Observer.	Observed Distance.	Refraction.	Aberration.	Sum = Σ 1889·0.	Corr. to Σ	Δσ
	1889			″	″	″	″		″
8	July 18	·57100	Hg.	6455·680	1·892	—0·003	6457·569	—1·051	—0·162
14	20	·59129	Hg.	4·317	2·245	— ·024	6·538	—0·020	— ·002
25	31	·56404	Hg.	4·451	2·304	— ·135	6·620	—0·102	— ·016

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Results of Observations of Standard Stars in Position-Angle.—Cape.

Rotation No.	Date.	Sidereal Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberration and Precession.	Mean Position-Angle, 1889·0.	Corr. to Standard Value.	Adopted Value of Δp.
	1889	h m		277° ′ + ″		′ ″	″	277° ′ + ″	″	″
43	June 19	17 3·8	G	48 13	− 34·3	−35 43·8	+ 2·8	11 58	− 4	− 4
70	23	16 8·3	G	48 43	− 73·7	−35 43·9	+ 3·1	11 49	+ 5	− 0·5
78	23	18 30·3	G	47 46	− 9·3	−35 39·6	+ 3·1	12 0	− 6	
81	25	22 21·2	A	47 33	+ 36·5	−36 18·7	+ 3·4	11 54	0	− 3
86	25	23 18·6	A	46 56	+ 72·3	−36 11·7	+ 3·4	12 0	− 6	
216	July 5	16 47·1	G	48 20	− 43·8	−35 44·3	+ 4·1	11 56	− 2	− 2
235	5	0 19·7	A	44 45	+201·5	−36 2·4	+ 4·1	12 8	− 14	− 14
312/4	18	17 6·9	A	47 58	− 34·0	−35 44·4	+ 5·0	11 45	+ 9	+ 9
315	18	22 52·4	G	47 25	+ 52·5	−36 13·8	+ 5·0	12 9	− 15	− 15
358	20	17 8·9	A	47 41	− 33·0	−35 44·4	+ 5·1	11 29	+ 25	+ 25
371	20	23 25·0	G	46 52	+ 81·7	−36 9·1	+ 5·1	12 10	− 16	− 16
384	21	16 24·8	G	48 28	− 59·2	−35 43·7	+ 5·2	11 50	+ 4	− 3
389	21	17 15·1	G	48 13	− 30·6	−35 43·2	+ 5·2	12 4	− 10	
394	21	23 4·0	A	47 22	+ 61·8	−36 11·6	+ 5·2	12 17	− 23	− 23
412	22	16 26·8	A	48 13	− 57·3	−35 43·7	+ 5·2	11 37	+ 17	+ 17
423	22	0 7·2	G	45 3	+157·4	−36 2·7	+ 5·2	11 43	+ 11	+ 11
472	25	16 0·8	G	48 56	− 82·4	−35 42·9	+ 5·4	11 56	− 2	− 2
500	26	15 59·3	A	48 56	− 83·9	−35 42·9	+ 5·5	11 55	− 1	− 1
510	26	23 15·4	G	47 2	+ 70·3	−36 11·3	+ 5·5	12 7	− 13	− 13
516	27	16 36·4	G	48 15	− 50·2	−35 43·6	+ 5·5	11 47	+ 7	+ 6
521	27	17 13·3	G	47 59	− 31·2	−35 43·3	+ 5·5	11 50	+ 4	
526	27	22 32·1	A	47 16	+ 41·6	−36 17·2	+ 5·5	11 46	+ 8	+ 8
575	31	23 18·0	A	46 47	+ 71·6	−36 10·0	+ 5·8	11 54	0	0
616	Aug. 5	16 22·7	A	48 7	− 61·5	−35 43·7	+ 6·0	11 28	+ 26	+ 26
634	6	16 47·4	G	47 58	− 44·0	−35 44·3	+ 6·1	11 36	+ 18	+ 21
639	6	17 33·7	G	47 32	− 23·9	−35 43·3	+ 6·1	11 31	+ 23	
648/9	6	22 39·5	A	47 11	+ 46·0	−36 16·2	+ 6·1	11 47	+ 7	+ 7
668	7	16 14·7	A	48 22	− 66·5	−35 43·8	+ 6·1	11 38	+ 16	+ 16
685	7	0 2·3	G	45 15	+143·6	−36 4·2	+ 6·1	11 41	+ 13	+ 13
686	8	15 29·9	G	49 8	−134·0	−35 43·0	+ 6·2	11 17	+ 37	+ 28
699	8	17 13·0	G	47 43	− 30·9	−35 43·2	+ 6·2	11 35	+ 19	
727	9	16 30·0	A	48 18	− 54·4	−35 43·7	+ 6·2	11 46	+ 8	+ 16
736	9	17 20·7	A	47 36	− 28·1	−35 42·9	+ 6·2	11 31	+ 23	
775	12	15 50·2	G	48 45	− 94·7	−35 43·0	+ 6·4	11 34	+ 20	Only for control of zero.
811	16	22 45·8	A	47 26	+ 48·1	−36 14·5	+ 6·5	12 6	− 12	− 12
873	22	17 25·2	G	47 27	− 25·7	−35 42·7	+ 6·8	11 25	+ 29	+ 29
888	22	22 41·5	A	47 6	+ 45·3	−36 16·1	+ 6·8	11 42	+ 12	+ 12
902	23	17 38·2	A	47 30	− 21·6	−35 43·2	+ 6·8	11 32	+ 22	+ 22
907	23	22 27·4	G	47 12	+ 38·8	−36 17·8	+ 6·8	11 40	+ 14	+ 14
922	24	23 47·2	A	45 56	+109·9	−36 5·7	+ 6·9	11 47	+ 7	+ 7
937	26	22 27·9	A	47 19	+ 39·4	−36 17·7	+ 6·9	11 48	+ 6	+ 6

On Aug. 1 the head was removed and lenses cleaned, to remove rain-drops which had got between lenses, hence change in Δp.

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Results of Observations of Standard Stars in Position-Angle.—Yale.

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberration and Precession.	Mean Position-Angle, 1889·0.	Corr. to Standard Value.	Adopted value of Δp.
	1889				277° + ′ ″	″	′ ″	″	277° + ′ ″	″	″
18	June	20	·71213	E	12 40	+ 57	− 1 17	+ 3	12 23	− 29	+ 8
28		20	·74105	E	11 29	+ 36	− 0 59	+ 3	11 9	+ 45	
31		20	·76698	H	11 33	+ 23	− 0 45	+ 3	11 14	+ 40	+ 48
45		20	·82987	H	11 11	± 00	− 0 16	+ 3	10 58	+ 56	
71		23	·74676	E	12 53	+ 29	− 0 52	+ 3	12 33	− 39	− 31
89		23	·78514	E	12 31	+ 13	− 0 31	+ 3	12 16	− 22	
91		23	·84893	H	10 12	− 11	+ 1 15	+ 3	11 19	+ 35	+ 35
160	July	5	·82852	H	10 31	− 16	+ 1 17	+ 4	11 36	+ 18	+ 18
162		6	·67521	E	12 30	+ 50	− 1 14	+ 4	12 10	− 16	− 16
192		6	·76962	H	11 56	+ 6	− 0 22	+ 4	11 44	+ 10	+ 10
194		7	·64730	H	11 57	+ 76	− 1 27	+ 4	11 50	+ 4	− 12
208		7	·73337	H	12 38	+ 18	− 0 38	+ 4	12 22	− 28	
210		7	·74258	E	9 52	+ 15	+ 0 46	+ 4	10 57	+ 57	+ 25
224		7	·77863	E	10 55	+ 2	+ 1 1	+ 4	12 2	− 8	
226		12	·63702	H	11 53	+ 71	− 1 26	+ 5	11 43	+ 11	+ 37
238		12	·72199	H	11 5	+ 17	− 0 36	+ 5	10 51	+ 63	
240		12	·73572	E	12 2	+ 12	− 0 30	+ 5	11 49	+ 5	+ 14
254		12	·79375	E	11 40	− 9	− 0 5	+ 5	11 31	+ 23	
256		15	·62737	H	12 26	+ 75	− 1 26	+ 5	12 20	− 26	− 6
276		15	·68402	H	11 58	+ 30	− 0 53	+ 5	11 40	+ 14	
278		15	·73792	E	10 19	+ 10	+ 0 54	+ 5	11 28	+ 26	+ 23
292		15	·77077	E	10 24	− 3	+ 1 8	+ 5	11 34	+ 20	
301		16	·67120	E	11 19	+ 35	− 0 59	+ 5	11 0	+ 54	+ 54
318		16	·80945	H	10 13	− 23	+ 1 20	+ 5	11 15	+ 29	+ 29
326		17	·63560	H	11 45	+ 59	− 1 19	+ 5	11 30	+ 24	+ 20
340		17	·68635	H	11 57	+ 26	− 0 49	+ 5	11 39	+ 15	
350		17	·78351	E	10 10	− 11	+ 1 14	+ 5	11 18	+ 36	+ 36
360		18	·63654	E	12 42	+ 56	− 1 16	+ 5	12 57	− 33	− 12
378		18	·68181	E	12 2	+ 27	− 0 50	+ 5	11 44	+ 10	
380		18	·75882	H	10 48	− 1	+ 1 6	+ 5	11 58	− 4	+ 19
402		18	·83676	H	10 32	− 49	+ 1 25	+ 5	11 13	+ 41	
404		20	·64582	E	13 1	+ 43	− 1 7	+ 5	12 42	− 48	− 48*
418		21	·61358	H	11 41	+ 71	− 1 25	+ 5	11 32	+ 22	+ 8
436		21	·68016	H	12 18	+ 24	− 0 46	+ 5	12 1	− 7	
438		21	·77480	E	10 44	− 11	+ 1 15	+ 5	11 53	+ 1	− 3
456		21	·80976	E	11 4	− 32	+ 1 23	+ 5	12 0	− 6	
458		22	·62664	E	11 24	+ 54	− 1 16	+ 5	11 7	+ 47	+ 33
476		22	·66775	E	11 53	+ 28	− 0 51	+ 5	11 35	+ 19	

* See note at end of this Table.

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Results of Observations of Standard Stars in Position-Angle.—Yale—*continued.*

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberr. and Prec.	Mean Position-Angle, 1889·0.	Corr. to Standard Value.	Adopted Value of Δp.
	1889				277° + ′ ″	″	′ ″	″	277° + ′ ″	″	″
514	July	25	·60273	H	11 45	+ 72	− 1 25	+ 5	11 37	+17	+ 6
536		25	·65931	H	12 16	+ 25	− 0 46	+ 5	12 0	− 6	
538		25	·75381	E	9 44	− 7	+ 1 12	+ 5	10 54	+60	+17
552		25	·79053	E	11 20	− 26	+ 1 21	+ 5	12 20	−26	
596	August	5	·62268	E	12 40	+ 32	− 0 55	+ 6	12 23	−29	−19
606		5	·64064	E	12 19	+ 23	− 0 45	+ 6	12 3	− 9	
640		8	·71834	E	10 20	− 8	+ 1 13	+ 6	11 31	+23	+ 5
642		8	·72217	E	10 58	− 10	+ 1 14	+ 6	12 8	−14	
684		16	·58270	E	12 4	+ 38	− 1 1	+ 7	11 48	+ 6	+19
686		16	·58630	E	11 39	+ 36	− 0 59	+ 7	11 23	+31	
696		16	·73418	E	10 34	− 29	+ 1 22	+ 7	11 34	+20	+16
698		16	·73694	E	10 45	− 31	+ 1 22	+ 7	11 43	+11	
746		22	·72196	E	10 42	− 32	+ 1 22	+ 7	11 39	+15	+27
748		22	·72491	E	10 19	− 34	+ 1 23	+ 7	11 15	+39	

The value of Δp on July 20, *viz.*, $-48''$, is quite anomalous, and is apparently the result of some undetected error of observation. In forming the absolute terms of the Equations based on Ephemeris II., Δp on July 20 has been assumed equal to the mean of the values observed (Telescope West) on July 17, 18, 21 and 22, *viz.*—

$$\Delta p = +8''.$$

Results of Observations of Standard Stars in Position-Angle.—Leipzig.

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberr. and Prec.	Mean Position-Angle, 1889·0.	Δp.	Counterpoise.
					186° + ′ ″	″	91° + ′ ″	″	277° + ′ ″	″	
27	June	18	·60527	P	11 9	+ 1	+ 0 32	+ 3	11 45	+ 9	Prec.
30		20	·45086	P	9 38	+ 145	− 0 19	+ 3	11 47	+ 7	Prec.
34		20	·52659	P	11 0	+ 43	+ 0 3	+ 3	11 49	+ 5	Prec.
38		20	·58071	P	14 24	+ 11	− 2 26	+ 3	12 12	− 18	Fol.
49		24	·43537	P	9 25	+ 159	− 0 19	+ 3	11 48	+ 8	Prec.
54		24	·53267	P	11 2	+ 32	+ 0 7	+ 3	11 44		Prec.
59		25	·43442	P	12 43	+ 152	− 3 40	+ 3	11 38	+ 16	Fol.
68		25	·55580	P	11 12	+ 17	+ 0 16	+ 3	11 49	+ 5	Prec.
70		25	·57506	P	11 23	+ 7	+ 0 23	+ 3	11 56	− 2	Prec.

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Results of Observations of Standard Stars in Position-Angle.—Leipzig—*continued.*

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberr. and Prec.	Mean Position-Angle, 1889·0.	Δp.	Counterpoise.
					186° + ′ ″	″	91° + ′ ″	″	277° + ′ ″	″	
102	July	7	·44019	P	13 36	+ 79	− 3 22	+ 4	11 37	+ 17	Fol.
120		21	·37592	P	13 28	+ 121	− 3 34	+ 5	12 0	− 6	Fol.
121		21	·39276	P	13 39	+ 92	− 3 27	+ 5	11 49	+ 5	Fol.
126		21	·45988	P	14 1	+ 31	− 2 48	+ 5	11 49	+ 5	Fol.
127		21	·46785	P	13 55	+ 26	− 2 43	+ 5	11 43	+ 11	Fol.
145		31	·35661	P	13 20	+ 107	− 3 31	+ 6	11 42	} + 11	Fol.
150		31	·41572	P	13 53	+ 42	− 2 57	+ 6	11 44		Fol.
155		31	·51252	P	11 13	− 14	+ 0 49	+ 6	11 54	0	Prec.
167	August	7	·50970	P	14 10	− 26	− 1 52	+ 6	11 58	− 4	Fol.
179		12	·33781	P	13 41	+ 84	− 3 10	+ 6	12 1	− 7	Fol.
182		12	·37559	P	14 10	+ 47	− 3 2	+ 6	12 2	− 8	Fol.
217		25	·42074	P	14 5	± 0	− 2 14	+ 7	11 58	− 4	Fol.

Results of Observations of Standard Stars in Position-Angle.—Göttingen.

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Corr. for Instr. Adj.	Aberr. and Prec.	Mean Position-Angle, 1889·0.	Δp.	Axis.
					277° + ′ ″	″	′ ″	″	277° + ′ ″	′ ″	
7	1889. June	20	·53208	S	10 6	+ 44	+ 1 57	+ 3	12 50	− 0 56	f
26		24	·56625	S	10 14	+ 17	+ 1 55	+ 3	12 29	− 0 35	f
32		25	·55785	S	10 30	+ 20	+ 1 55	+ 3	12 48	− 0 54	f
45	July	9	·52188	S	10 19	+ 19	+ 1 55	+ 4	12 37	− 0 43	f
46		9	·55299	S	8 31	+ 2	+ 1 27	+ 4	10 4	+ 1 50	p
52		10	·49917	S	9 58	+ 29	+ 1 56	+ 4	12 27	− 0 33	f
66		31	·52632	S	10 49	− 19	+ 1 43	+ 6	12 19	− 0 25	f
68		31	·58556	S	10 32	− 92	+ 1 0	+ 6	10 6	+ 1 48	p
80	August	5	·50410	S	10 43	− 13	+ 1 45	+ 6	12 21	− 0 27	f
86(b)		8	·58466	S	11 43	− 173	+ 0 48	+ 6	9 44	+ 2 10	p
96		16	·42049	S	10 2	+ 18	+ 1 55	+ 6	12 21	− 0 27	f

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Results of Observations of Standard Stars in Position-Angle.—Bamberg.

Rotation No.	Date.		Berlin Mean Time.	Observer.	Observed Position-Angle.	Refraction.	Aberr. and Prec.	Mean Position-Angle, 1889·0.	Δp.
					277° + ′ ″	″		277° + ′ ″	′ ″
	1889.								
9	July	18	·58450	Hg.	13 5	— 38	+ 5	12 32	— 0 38
15		20	·60406	Hg.	12 37	— 69	+ 5	11 33	+ 0 21
20		22	·59061	Hg.	12 54	— 58	+ 5	12 1	— 0 7
21		22	·60983	Hg.	12 31	— 90	+ 5	11 6	+ 0 48
26		31	·57858	Hg.	12 54	— 76	+ 6	11 44	+ 0 10

Comparison of Observed and Tabular Quantities.

The following Tables contain the results of the preliminary reductions of the observations of *Victoria* compared with the Tabular quantities, arranged separately for each Observatory in a convenient form for their subsequent discussion.

An "observation" is defined as the mean of four pointings, two in each of the two relative positions of the segments. When any pointing is considered doubtful, and consequently has been repeated by the observer, as is sometimes the case when the Images are very blurred and unsteady, the pointings in an observation may amount to six or eight in number, but are regarded as only equal to four. The result of each "observation" is given in a separate line, except in a few instances when the reason for the exception is mentioned in the foot-notes.

A "set of observations" is defined as all the observations of the same class made by the same observer, at the same sitting. If an observer measures position-angles as well as distances at the same sitting the observations appear in the Tables as two separate sets. In some few cases in the Northern Hemisphere, observations of the same set have been begun near the meridian and continued past it in the same "set"—but usually when an observer makes observations of any kind *East* of the Meridian, and then, some hours afterwards, similar observations *West* of the Meridian, such observations are regarded as two separate "sets." Practically a "set" may be defined as a nearly continuous series of observations by the same observer yielding equations of condition

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so similar that they may be combined in the mean as one equation without sensible disadvantage.*

The various "Sets" of observations have been divided into "Groups" according to the date of observation. The limits of these groups are so fixed as to afford in general a strong determination of the Planet's Right Ascension, Declination and Parallax from each group. In the case of the first "Group," however, these conditions are not fulfilled, because, until June 15, only two sets of observations were made, viz., those on June 10 at the Cape and on June 11 at Göttingen, both consisting only of measures of the distance of the planet from the opposite stars κ and μ, and it seemed undesirable to unduly extend the limits of our present Group II. by including in it these comparatively isolated observations.

Group I. thus contains only two sets of Observations, which afford a determination of the Parallax, but do not afford data to distinguish between the Tabular errors in Right Ascension and Declination. All details of the observations will be found in Vol. II., Part 1.

The detailed comparison of Observed and Tabular quantities is given in the following Tables :—

Table A	... ...	Cape observations of Distance
B	... ...	Yale " "
C	... ...	Leipzig " "
D	... ...	Göttingen " "
E	... ...	Bamberg " "
F	... ...	Cape observations of Position-Angle.
G	... ...	Yale " "
H	... ...	Leipzig " "
I	... ...	Göttingen " "
K	... ...	Bamberg " "

* If each observation could be regarded as complete by itself there would be some advantage in keeping the equations separate because of the sometimes considerable change in the parallax-factors in the same set, and these factors should, theoretically, enter into the normal equations for the parallax with the relative weight of their squares. But on the other hand the parallax-factors generally increase with the Zenith Distance, and therefore also with the uncertainties of the refraction-corrections and with the unsteadiness and want of sharpness in the images, thus a certain compensation of weights takes place. But, above all, the mean of a number of symmetrically arranged observations of two stars on opposite sides of the planet completely eliminates the effect of a progressive change of scale-value, and this consideration is conclusive in favour of the plan of forming a single equation from the mean of each set of similar observations.

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In all these Tables the columns on the left-hand side of the page are similarly arranged, viz. :—

Column 1 gives the number of the "Group" and "Set" as above defined ; thus III_4 means "Set" No. 4 of Group III.

Column 2 gives the rotation-number of each observation, corresponding to the numbering of the original observations ; this will be found useful as an easy means of reference to the details of each observation as given in Vol. II., Part 1.

Column 3 gives the adopted name of the Star of comparison.

Column 4 gives the month and day of observation, and beneath, in brackets, the figure (1), (2) or (3) to indicate whether the observing conditions were respectively "good," "indifferent" or "bad."

Column 5 gives the observer.

A	denotes	Auwers	Cape.	P	denotes	Peter, Leipzig.
G	„	Gill		S	„	Schur, Göttingen.
E	„	Elkin	Yale.	Hg	„	Hartwig, Bamberg
H	„	Hall				

Column 6 gives the mean instant of observation (that is, the mean of the epochs of the four pointings) in Berlin Mean Time expressed in decimals of a day.

Columns 7 and 8 give respectively the Tabular Right Ascension and Declination interpolated for the mean instant of observation from the Ephemeris, having regard to the necessary correction for aberration time.

Columns 9 and 10 give respectively the planet's parallax in Right Ascension and Declination computed on the assumption that the Sun's Mean Equatorial Horizontal parallax is 8″·80.

Columns 11 and 12 are respectively the corrections applicable to the mean R.A. and Dec. of the comparison stars on account of Precession, Aberration, and Nutation, omitting the small terms of the Nutation depending on 2 ☽.

These corrections have been checked by independent computations with the Day numbers both of the *Berliner Jahrbuch* and the *Connaissance des Temps*, and by independent interpolation from both computations to the epoch of each observation. The small terms of the Nutation omitted in the star-corrections have also been omitted in the Ephemeris of the planet.

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In the Tables resulting from observations of Distance—

Column 15 gives the mean Tabular Position-Angle, to the nearest minute of arc, for each observation.

Column 16, the Instrumental Distance computed from the original observations in the manner described in Vol. II., Part I., Introduction, pp. 43, &c.

Column 17, the Refraction, computed from Jacoby's Tables, with the arguments "Hour-Angle," "Tabular Distance," and "Position-Angle."*

Column 18, the Observed Distance corrected for Refraction = (16) + (17).

Column 19, the Tabular Apparent Distance, rigorously computed from the data of columns 7, 8, 9, 10, 11, and 12, and with the star places derived by Auwers from the Meridian Observations (Triangulation, Chap. V., Table 5, pp. 116, 117).†

Column 20, the comparison between the Observed and Computed distance in the sense "Observed *minus* Computed."

Column 21, the factor of x' (where $x' = \Delta\alpha \cos. \delta$) or the effect on the computed distance of increasing x' by $1'' =$ sin. position-angle $= f'$.

Column 22, the factor of y' (where $y' = \Delta\delta$) or the effect on the distance of increasing the tabular value of y' by $1'' =$ cos. position-angle $= f''$.

Column 23, the parallax factor in distance, or the effect on the computed distance of increasing the tabular value of the assumed parallax by 10%,

$$= f' \left(\frac{\text{Parallax in R.A.} \times \cos \delta}{10}\right) + f'' \left(\frac{\text{Parallax in Decl.}}{10}\right) = f'''.$$

In the Tables resulting from observations of Position-Angle—

Column 15 gives the Tabular Distance to the nearest second of arc.

Column 16, the minutes and seconds of the Instrumental Position-Angle as computed from the original observation (Vol. II., Part I.) corrected for Equatorial Adjustments (by means of the Tables given at pp. 251–253 of the present chapter).

---

* These Tables, together with an account of their formation, by Mr. Jacoby, are printed at the conclusion of Vol. II. Separate copies of the Tables will be supplied to Astronomers who may require them.

† These computations were begun some time before the discussion of the Triangulation was undertaken, hence Auwers' results were alone available; the corrections to the Tabular Distances, depending on the values of x and y determined by the Triangulation (pp. 222–223), are applied at a later stage of the work.

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Column 17 gives the correction for Refraction in Position-Angle expressed in seconds of arc, computed by Jacoby's Tables.

Column 18, the Observed Position-Angle corrected for Refraction.

Column 19, the minutes and seconds of the Tabular Position-Angle at the middle point between star and planet, computed from the data of columns 7, 8, 9, 10, 11, and 12, and with the star places derived by Auwers from the Meridian Observations. (Triangulation, Chap. V., Table 5, pp. 116, 117, and by the formulæ p. 118.)

Column 20, the comparison between the Observed and Computed Position-Angle in the sense "Observed *minus* Computed."

Column 21, the same comparison as in column 20, expressed in seconds of arc on the great circle.

Column 22, the factor of x' = cos. position-angle = f'_p.

Column 23, the factor of y' = − sin. position- angle = f''_p.

Column 24, the parallax factor in position-angle (reckoned on the great circle), viz.—

$$f'''_p = f'_p \left(\frac{\text{Parallax in R.A.} \times \cos \delta}{10}\right) + f''_p \left(\frac{\text{Parallax in Decl.}}{10}\right)$$

The following will be found a convenient index to the groups and to the observations and their discussion generally :—

INDEX TO GROUPS AND OBSERVATIONS.

Group.	Date.	Stars of comparison.	Cape.		Yale.		Leipzig.		Göttingen.		Bamberg.	
			E.	W.	E.	W.	E.	W.	E.	W.	E.	W.
			s p	s p	s p	s p	s p	s p	s p	s p	s p	s p
	1889.											
I.	June 10	κ μ	...	4 0	...	...	...	...	...	...	...	...
	11	κ μ	...	...	...	...	...	...	...	2 0	...	...
II.	June 15	μ θ	...	4 0	...	...	...	...	...	...	...	...
	16	μ θ	0 4	...	...	...	...	...	...	...	...	...
	17	μ θ	0 4	8 0	8 0	...	4 0	...	...	...	...	...
	18	μ θ	0 4	8 0	8 0	...	8 2	...	2 0	...	...	...

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INDEX TO GROUPS AND OBSERVATIONS—*continued.*

Group.	Date.	Stars of comparison.	Cape.		Yale.		Leipzig.		Göttingen.		Bamberg.	
			E.	W.	E.	W.	E.	W.	E.	W.	E.	W.
			s p	s p	s p	s p	s p	s p	s p	s p	s p	s p
	1889.											
III.	June 19	λ	3 0	...	...	...	0 1	...	...	...	...	...
	20	λ	...	...	4 4	3 6	2 3	...	0 2	...	...	...
	21	θ λ	4 4	...	...	...	2 0	...	4 4	...	...	...
	22	θ λ	4 4	2 4	8 8	4 4	8 0	...	4 0	...	...	...
	23	θ	4 2	...	4 8	2 4	...	...	...	...	...	...
	24	θ	...	...	...	...	2 4	...	2 2	...	...	...
	25	θ	...	2 2	...	...	4 4	...	2 2	...	...	...
IV.	June 26	ε λ	8 0	...	10 0	...	8 0	...	4 0	...	...	2 0
	26	ι ζ	...	4 0	...	...	...	...	...	...	...	...
	27	ι ζ	8 0	...	...	...	...	...	...	...	...	...
	27	ε λ	...	8 0	8 0	...	...	...	...	...	...	...
	28	ζ η	8 0	...	...	...	...	...	...	...	...	...
	28	γ λ	...	8 0	...	...	4 0	...	...	...	...	...
	29	η ζ	8 0	...	...	8 0	...	...	...	...	...	...
	29	γ λ	...	8 0	8 0	...	2 0	...	...	...	...	...
	30	ε δ	8 0	...	...	...	...	...	...	...	...	...
	30	y θ	...	8 0	...	...	8 0	...	...	...	...	...
	July 1	ε δ	4 0	...	...	...	...	...	...	...	...	...
	1	y θ	...	8 0	...	...	...	...	...	...	...	...
	2	η α	8 0	...	...	...	...	...	...	...	...	...
	2	y θ	...	8 0	...	...	...	...	...	...	...	...
V.	July 3	β δ	...	8 0	...	...	...	...	...	...	...	...
	4	γ α	8 0	...	...	...	...	...	...	...	...	...
	4	β δ	...	...	12 0	...	...	...	4 0	...	...	...
	5	z	4 4	4 [4]	...	6 [6]	...	...	...	...	...	...
	6	z	...	...	8 4	8 6	...	[6] 0	...	...	...	...
	7	z	...	...	6 3	6 6	2 1	...	...	...	...	...
	8	y z x	12 0	...	...	...	...	...	...	...	...	...
VI.	July 9	y x	...	...	...	...	0 6	4 0	...	2 4	...	...
	10	x	10 0	0 2	...	...	...	...	...	2 2	...	...
	11	w x	...	8 0	...	...	2 0	...	4 0	...	...	0 2
	12	w	...	...	5 5	6 6	...	...	...	...	...	...
VII.	July 15	v	...	...	8 4	6 6	...	...	...	...	...	...
	16	u	...	[6](3)	[ ][ ]	[ ][ ]	...	...	1 0	...	...	...
	17	t	4 8	6 8	3 6	8 8	...	...	...	...	...	...
	18	t	4 4	4 2	8 8	5 10	...	...	...	...	...	2 0
	19	t q	8 4	4 8	...	...	...	...	...	...	...	...

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INDEX TO GROUPS AND OBSERVATIONS—*continued.*

Group.	Date.	Stars of comparison.	Cape.		Yale.		Leipzig.		Göttingen.		Bamberg.	
			E.	W.	E.	W.	E.	W.	E.	W.	E.	W.
			s p	s p	s p	s p	s p	s p	s p	s p	s p	s p
	1889.											
VIII.	July 20	q	8 8	4 4	3 6	...	...	...	...	...	...	2 2
	21	q	8 4	4 8	8 8	8 4	0 4	...	...	...	...	...
	22	q	4 6	4 2	8 8	...	...	...	...	...	...	1 2
IX.	July 23	r n	8 4	...	...	8 0	...	...	...	...	...	...
	23	p q	...	8 8	6 6	...	...	...	...	...	...	...
	24	r n	8 0	...	...	6 0	...	...	...	...	...	...
	24	p q	...	4 4	8 0	...	2 2	...	...	...	...	...
X.	July 25	p	4 8	8 4	10 [5]	6 6	...	...	...	...	...	...
	26	p	6 4	4 0	...	...	...	...	...	...	...	...
	27	p	4 4	4 4	..	...	...	...	...	...	...	...
XI.	July 28	p m	8 8	4 6	...	...	...	...	...	...	...	...
	29	o m	8 0	...	...	...	...	...	...	...	...	...
	29	n l	...	...	...	...	4 0	...	...	...	...	...
	30	o m	...	...	...	...	...	8 0	...	...	...	...
	31	m	...	4 4	...	...	2 2	1 1	2 1	0 2	...	2 2
	Aug. 1	k m	4 0	8 8	...	...	4 0	0 4	4 0	...	...	0 4
	2	k i	4 4	...	...	8 4	...	...	...	...	...	...
	3	h i	...	...	4 4	4 4	...	...	...	...	...	...
XII.	Aug. 4	g i	...	...	...	...	...	...	...	...	...	0 4
	5	g	6 8	...	8 4	...	...	...	2 2	...	...	...
	6	f	8 4	8 8	...	...	...	...	1 0	...	...	...
	7	f	8 4	4 8	6 6	6 3	...	[2] [2]	...	...	...	...
	8	f	2 8	8 8	...	2 4	...	...	...	[2] [2]	...	...
	9	f	8 8	...	...	...	...	...	...	...	...	...
XIII.	Aug. 10	f e	8 4	4 8	4 8	...	0 2	...	0 4	[2] 0	...	...
	10	e	...	...	...	...	...	1 0	...	...	...	...
	11	f e	8 4	0 2	4 8	...	...	4 0	...	...	...	...
	11	f	...	...	...	...	...	...	...	1 0	...	...
	12	e	8 0	...	...	...	0 2	5 0	...	...	...	...
	14	e	4 4	...	...	...	...	...	...	...	...	...
	16	e	4 4	4 8	2 4	4 4	...	5 0	0 2	2 0	...	...

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INDEX TO GROUPS AND OBSERVATIONS—*concluded.*

Group.	Date.	Stars of comparison.	Cape.		Yale.		Leipzig.		Göttingen.		Bamberg.	
			E.	W.	E.	W.	E.	W.	E.	W.	E.	W.
			s p	*s p*	*s p*	*s p*	*s p*	*s p*	*s p*	*s p*	*s p*	*s p*
	1889.											
XIV.	Aug. 17	f a	4 0	...	...	8 0	...	4 0	...	...	...	...
	17	c d	...	...	12 0	...	...	...	4 0	...	...	...
	18	f a	8 0	...	...	...	...	8 0	...	...	...	...
	18	c d	...	...	8 0	...	4 0	...	...	...	...	...
	19	f a	8 0	...	...	...	...	...	...	...	...	...
	19	c d	...	8 0	...	...	...	...	...	...	...	...
	20	d	...	8 0	...	...	2 0	...	2 0	...	...	...
	20	b e	...	...	...	...	...	...	...	4 0	...	...
	21	b e	8 0	...	...	8 0	...	...	...	...	...	...
XV.	Aug. 22	d	4 8	8 4	...	[2] 5	...	...	...	1 1	...	...
	23	d	4 4	6 4	...	...	...	...	...	...	...	...
	24	d	...	4 4	...	...	...	...	...	...	...	...
	25	d	...	...	...	...	...	3 3	...	1 2	...	...
	26	d	4 1	6 8	...	...	...	...	...	...	...	...
Total number of observations.			295 153	238 140	199 112	130 90	74 33	43 8	42 19	15 11	...	9 16
			826 In Southern Hemisphere.		801 In Northern Hemisphere.							

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TABLE A.—CAPE DISTANCES,

1	2	3	4	5	6	7	8	9	10	11	12
Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
I	3	κ	June 10 ...	G	·69013	300 48 37·14	− 8 51 14·03	−4·105	+4·027	+20·73	+ 3·79
	4	μ	(2)		·70368	48 36·92	51 6·00	−4·647	+4·086	+20·51	+ 3·99
	5	μ			·71524	48 36·74	50 59·16	−5·078	+4·131	+20·51	+ 3·99
	6	κ			·73510	48 36·39	50 47·40	−5·758	+4·234	+20·75	+ 3·79
II_1	7	μ	June 15 ...	A	·68702	300 40 47·11	− 8 3 19·87	−4·689	+4·303	+22·36	+ 4·62
	8	θ	(3)		·69616	40 45·54	3 14·78	−5·046	+4·350	+22·55	+ 4·08
	9	θ			·70112	40 44·68	3 12·01	−5·239	+4·369	+22·55	+ 4·08
	10	μ			·70810	40 43·48	3 8·12	−5·498	+4·393	+22·36	+ 4·62
II_2	19	μ	June 17 ...	A	·67520	300 34 4·93	− 7 45 8·42	−4·496	+4·370	+23·06	+ 4·87
	20	θ	(3)		·68332	34 3·02	45 4·03	−4·830	+4·402	+23·23	+ 4·35
	21	θ			·69101	34 1·23	44 59·87	−5·134	+4·436	+23·23	+ 4·35
	22	μ			·69929	33 59·30	44 55·40	−5·451	+4·473	+23·07	+ 4·87
	23	μ			·70433	33 58·13	44 52·68	−5·634	+4·498	+23·07	+ 4·87
	24	θ			·71671	33 55·23	44 45·99	−6·059	+4·557	+23·24	+ 4·36
	25	θ			·72158	33 54·09	44 43·36	−6·217	+4·583	+23·24	+ 4·36
	26	μ			·72921	33 52·31	44 39·24	−6·455	+4·624	+23·08	+ 4·87
II_3	31	μ	June 18 ...	G	·67928	300 29 55·96	− 7 36 10·09	−4·815	+4·444	+23·41	+ 4·99
	32	θ	(1)		·68853	29 53·53	36 5·17	−5·180	+4·483	+23·57	+ 4·48
	33	θ			·69325	29 52·28	36 2·67	−5·363	+4·503	+23·57	+ 4·48
	34	μ			·70425	29 49·38	35 56·83	−5·765	+4·554	+23·42	+ 4·99
	35	μ			·71456	29 46·66	35 51·35	−6·121	+4·605	+23·42	+ 4·99
	36	θ			·72454	29 44·02	35 46·05	−6·438	+4·648	+23·58	+ 4·49
	37	θ			·72816	29 43·06	35 44·13	−6·548	+4·678	+23·58	+ 4·49
	38	μ			·73451	29 41·37	35 40·76	−6·731	+4·712	+23·43	+ 4·99
III_1	39	λ	June 19 ...	G	·41118	300 26 35·30	− 7 29 43·49	+6·944	+4·778	+23·67	+ 4·71
	40	λ	(1)		·41874	26 33·14	29 39·52	+6·736	+4·736	+23·67	+ 4·71
	41	λ			·42384	26 31·68	29 36·84	+6·590	+4·708	+23·67	+ 4·71
III_2	48	θ	June 21 ...	G	·45009	300 15 52·28	− 7 12 13·65	+5·569	+4·638	+24·47	+ 4·84
	49	λ	(2)		·46031	15 48·75	12 8·48	+5·172	+4·596	+24·35	+ 4·96
	50	λ			·46787	15 46·13	12 4·67	+4·866	+4·566	+24·35	+ 4·96
	51	θ			·47677	15 43·05	12 0·18	+4·487	+4·534	+24·48	+ 4·84

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COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

13	14	15	16	17	18	19	20	21	22	23
Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
3	κ	123 39	2298·696	1·044	2299·740	2300·251	— 0·511	+ 0·832	— 0·554	— 0·560
4	μ	303 41	2066·186	1·030	2067·216	2067·692	— 0·476	— 0·832	+ 0·555	+ 0·609
5	μ	303 50	2070·117	1·151	2071·268	2072·019	— 0·751	— 0·831	+ 0·557	+ 0·647
6	κ	123 7	2280·877	1·617	2282·494	2283·503	— 1·009	+ 0·838	— 0·546	— 0·708
7	μ	331 23	4568·746	2·252	4570·998	4570·574	+ 0·424	— 0·479	+ 0·878	+ 0·600
8	θ	144 46	5086·030	2·890	5088·920	5089·293	— 0·373	+ 0·577	— 0·817	— 0·643
9	θ	144 45	5083·635	3·014	5086·649	5086·412	+ 0·237	+ 0·577	— 0·817	— 0·656
10	μ	331 24	4581·100	2·649	4583·749	4583·073	+ 0·676	— 0·479	+ 0·878	+ 0·646
19	μ	333 7	5721·270	2·624	5723·894	5722·310	+ 1·584	— 0·452	+ 0·892	+ 0·592
20	θ	140 24	3977·731	2·104	3979·835	3980·120	— 0·285	+ 0·637	— 0·771	— 0·644
21	θ	140 23	3973·104	2·242	3975·346	3975·568	— 0·222	+ 0·638	— 0·770	— 0·666
22	μ	333 7	5735·052	3·107	5738·159	5736·964	+ 1·195	— 0·452	+ 0·892	+ 0·643
23	μ	333 7	5737·574	3·242	5740·816	5740·022	+ 0·794	— 0·452	+ 0·892	+ 0·653
24	θ	140 20	3957·081	2·917	3959·998	3960·409	— 0·411	+ 0·638	— 0·770	— 0·734
25	θ	140 19	3953·726	3·097	3956·823	3957·546	— 0·723	+ 0·639	— 0·770	— 0·747
26	μ	333 7	5752·090	4·190	5756·280	5755·100	+ 1·180	— 0·452	+ 0·892	+ 0·701
31	μ	333 19	6310·190	3·091	6313·281	6314·345	— 1·064	— 0·449	+ 0·894	+ 0·611
32	θ	137 50	3406·980	1·989	3408·969	3410·462	— 1·493	+ 0·671	— 0·741	— 0·676
33	θ	137 49	3404·252	2·077	3406·329	3407·648	— 1·319	+ 0·672	— 0·741	— 0·690
34	μ	333 19	6325·189	3·748	6328·937	6329·646	— 0·709	— 0·449	+ 0·894	+ 0·663
35	μ	333 18	6332·341	4·137	6336·478	6335·964	+ 0·514	— 0·449	+ 0·893	+ 0·684
36	θ	137 45	3385·751	2·975	3388·726	3389·006	— 0·280	+ 0·672	— 0·740	— 0·773
37	θ	137 44	3383·419	3·131	3386·550	3386·853	— 0·303	+ 0·673	— 0·740	— 0·783
38	μ	333 18	6343·568	5·249	6348·817	6348·149	+ 0·668	— 0·449	+ 0·893	+ 0·720
39	λ	238 34	1054·400	1·186	1055·586	1055·726	— 0·140	— 0·853	— 0·522	— 0·836
40	λ	238 49	1054·450	1·042	1055·492	1055·685	— 0·193	— 0·856	— 0·518	— 0·818
41	λ	238 59	1054·193	0·954	1055·147	1055·684	— 0·537	— 0·857	— 0·515	— 0·802
48	θ	126 48	1828·718	0·557	1829·275	1830·163	— 0·888	+ 0·801	— 0·599	+ 0·165
49	λ	288 4	1624·793	0·583	1625·376	1625·116	+ 0·260	— 0·951	+ 0·310	— 0·345
50	λ	288 10	1628·929	0·559	1629·488	1629·046	+ 0·442	— 0·950	+ 0·312	— 0·316
51	θ	126 40	1812·780	0·527	1813·307	1813·968	— 0·661	+ 0·802	— 0·597	+ 0·087

II_3. The focal reading of the eye-piece was changed after No. 34, Gill having in mistake begun his observations with Auwers' setting of the eye-piece scale.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day. B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III₃	58	λ	June 22 ...	A	·45436	300 9 50·98	− 7 3 52·05	+5·316	+4·650	+24·66	+ 5·09
	59	θ	(2)		·46060	9 48·65	3 48·96	+5·066	+4·625	+24·79	+ 4·97
	60	θ			·46528	9 46·90	3 46·65	+4·875	+4·608	+24·79	+ 4·97
	61	λ			·47050	9 44·94	3 44·07	+4·650	+4·589	+24·67	+ 5·09
III₄	65	λ	June 22 ...	G	·68312	300 8 24·64	− 7 1 59·27	−5·550	+4·684	+24·74	+ 5·12
	66	λ	(2)		·69265	8 21·01	1 54·58	−5·905	+4·726	+24·74	+ 5·12
	67	θ			·71249	8 13·45	1 44·83	−6·575	+4·822	+24·87	+ 5·00
III₅	72	θ	June 23 ...	G	·42801	300 3 33·33	− 6 55 56·00	+6·207	+4·791	+25·10	+ 5·09
	73	θ	(2)		·44481	3 26·58	55 47·88	+5·598	+4·718	+25·10	+ 5·09
	74	θ			·45182	3 23·76	55 44·49	+5·322	+4·689	+25·11	+ 5·09
	75	θ			·47367	3 14·96	55 33·94	+4·404	+4·610	+25·11	+ 5·09
III₆	82	θ	June 25 ...	A	·66619	299 47 26·21	− 6 38 22·20	−5·247	+4·692	+25·78	+ 5·37
	85	θ	(3)		·68464	47 17·68	38 13·75	−5·954	+4·767	+25·78	+ 5·37
IV₁	88	ε	June 26 ...	A	·40009	299 41 40·09	− 6 32 49·50	+6·910	+4·995	+26·03	+ 5·18
	89	λ	(2)		·40716	41 36·69	32 46·33	+6·691	+4·961	+25·89	+ 5·58
	90	λ			·41246	41 34·13	32 43·95	+6·519	+4·935	+25·89	+ 5·58
	91	ε			·41900	41 30·98	32 41·01	+6·294	+4·905	+26·04	+ 5·19
	92	ε			·42300	41 29·05	32 39·21	+6·152	+4·888	+26·04	+ 5·19
	93	λ			·42898	41 26·17	32 36·53	+5·932	+4·861	+25·90	+ 5·59
	94	λ			·43344	41 24·02	32 34·53	+5·760	+4·844	+25·90	+ 5·59
	95	ε			·44008	41 20·82	32 31·55	+5·499	+4·817	+26·04	+ 5·19
IV₂	96	ι	June 26 ...	G	·64777	299 39 40·13	− 6 30 58·68	−4·682	+4·755	+25·89	+ 5·19
	97	ζ	(2)		·65714	39 35·56	30 54·50	−5·106	+4·791	+26·24	+ 5·61
	98	ζ			·66373	39 32·34	30 51·56	−5·378	+4·813	+26·24	+ 5·61
	99	ι			·68095	39 23·94	30 43·88	−6·045	+4·883	+25·90	+ 5·20
	100	ι			·69645	39 16·38	30 36·98	−6·586	+4·955	+25·90	+ 5·20
IV₃	101	ι	June 27 ...	G	·39756	299 33 27·69	− 6 25 28·83	+6·921	+5·025	+26·11	+ 5·29
	102	ζ	(2)		·41551	33 18·60	25 20·00	+6·335	+4·944	+26·47	+ 5·70
	103	ζ			·42352	33 14·54	25 16·51	+6·046	+4·906	+26·47	+ 5·70
	104	ι			·43211	33 10·18	25 12·76	+5·720	+4·875	+26·12	+ 5·30
	105	ι			·44345	33 4·43	25 7·82	+5·264	+4·832	+26·12	+ 5·30
	106	ζ			·45346	32 59·36	25 3·45	+4·840	+4·797	+26·48	+ 5·70
	107	ζ			·46101	32 55·52	25 0·16	+4·505	+4·772	+26·48	+ 5·70
	108	ι			·47079	32 50·55	24 55·90	+4·058	+4·744	+26·13	+ 5·30

IV₃ No. 101. Seconds of Apparent Declination should be 22″·80 instead of 25″·80. The error was discovered on revisal for discussion with Ephemeris II., and is corrected in that discussion.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
58	λ	297 46	2147·817	0·692	2148·509	2147·567	+ 0·942	− 0·885	+ 0·466	− 0·250
59	θ	118 12	1251·547	0·390	1251·937	1252·518	− 0·581	+ 0·881	− 0·473	+ 0·224
60	θ	118 9	1248·592	0·385	1248·977	1249·740	− 0·763	+ 0·882	− 0·472	+ 0·209
61	λ	297 52	2157·267	0·655	2157·922	2157·164	+ 0·758	− 0·884	+ 0·467	− 0·194
65	λ	299 8	2284·915	1·375	2286·290	2286·234	[+ 0·056*]	− 0·874	+ 0·487	+ 0·709
66	λ	299 12	2290·799	1·534	2292·333	2292·004	+ 0·329	− 0·873	+ 0·488	+ 0·742
67	θ	115 7	1100·601	0·960	1101·561	1101·878	− 0·317	+ 0·906	− 0·425	− 0·796
72	θ	99 13	741·101	0·369	741·470	741·817	− 0·347	+ 0·987	− 0·160	+ 0·532
73	θ	98 41	732·691	0·314	733·005	733·346	− 0·341	+ 0·989	− 0·151	+ 0·479
74	θ	98 28	729·009	0·293	729·302	729·794	− 0·492	+ 0·989	− 0·147	+ 0·453
75	θ	97 45	718·226	0·251	718·477	718·762	− 0·285	+ 0·991	− 0·135	+ 0·371
82	θ	345 36	964·687	0·466	965·153	964·842	+ 0·311	− 0·249	+ 0·969	+ 0·584
85	θ	345 12	975·515	0·534	976·049	975·408	+ 0·641	− 0·255	+ 0·967	+ 0·612
88	ε	153 54	5009·445	1·516	5010·961	5011·737	− 0·776	+ 0·440	− 0·898	− 0·147
89	λ	308 39	4587·686	1·461	4589·147	4588·282	+ 0·865	− 0·781	+ 0·625	− 0·209
90	λ	308 39	4591·106	1·432	4592·538	4591·874	+ 0·664	− 0·781	+ 0·625	− 0·198
91	ε	153 58	4997·973	1·513	4999·486	4999·948	− 0·462	+ 0·439	− 0·898	− 0·166
92	ε	153 59	4995·480	1·513	4996·993	4997·445	− 0·452	+ 0·439	− 0·899	− 0·172
93	λ	308 40	4602·634	1·365	4603·999	4603·094	+ 0·905	− 0·781	+ 0·625	− 0·156
94	λ	308 40	4605·613	1·351	4606·964	4606·130	+ 0·834	− 0·781	+ 0·625	− 0·144
95	ε	154 2	4985·031	1·517	4986·548	4986·753	− 0·205	+ 0·438	− 0·899	− 0·194
96	ι	196 37	6690·887	2·246	6693·133	6694·483	− 1·350	− 0·286	− 0·958	− 0·323
97	ζ	14 15	5528·101	1·864	5529·965	5529·218	+ 0·747	+ 0·246	+ 0·969	+ 0·339
98	ζ	14 13	5530·384	1·875	5532·259	5531·235	+ 1·024	+ 0·246	+ 0·969	+ 0·334
99	ι	196 48	6681·807	2·296	6684·103	6685·229	− 1·126	− 0·289	− 0·957	− 0·293
100	ι	196 53	6677·572	2·351	6679·923	6680·883	− 0·960	− 0·290	− 0·957	− 0·284
101	ι	200 29	6489·270	5·184	6494·454	6495·849	− 1·395	− 0·350	− 0·937	− 0·711
102	ζ	9 57	5778·304	3·065	5781·369	5780·475	+ 0·894	+ 0·173	+ 0·985	+ 0·596
103	ζ	9 54	5780·933	2·892	5783·825	5783·136	+ 0·689	+ 0·172	+ 0·985	+ 0·587
104	ι	200 41	6482·781	3·648	6486·429	6487·510	− 1·081	− 0·353	− 0·936	− 0·657
105	ι	200 45	6481·079	3·362	6484·441	6485·122	− 0·681	− 0·354	− 0·935	− 0·638
106	ζ	9 43	5791·542	2·473	5794·015	5793·128	+ 0·887	+ 0·169	+ 0·986	+ 0·554
107	ζ	9 41	5794·180	2·402	5796·582	5795·645	+ 0·937	+ 0·168	+ 0·986	+ 0·545
108	ι	200 55	6476·067	2·882	6478·949	6479·412	− 0·463	− 0·357	− 0·934	− 0·587

* III_4 The observation of θ corresponding to Obs. 65 of λ was inadvertently omitted,—hence 65 is rejected.

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Set.	Rotation No	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
IV₄	109	ε	June 27 ...	A	·65369	299° 31′ 17″·25	— 6° 23′ 36″·44	—5″·112	+4″·827	+26″·38	+ 5″·35
	110	λ			·66251	31 12·72	23 32·62	—5·474	+4·861	+26·27	+ 5·74
	111	λ			·66913	31 9·33	23 29·75	—5·738	+4·885	+26·27	+ 5·74
	112	ε			·67681	31 5·71	23 26·70	—6·009	+4·914	+26·39	+ 5·35
	113	ε	(2)		·68092	31 3·28	23 24·65	—6·182	+4·934	+26·39	+ 5·35
	114	λ			·68837	30 59·46	23 21·42	—6·446	+4·966	+26·28	+ 5·74
	115	λ			·69334	30 56·91	23 19·27	—6·614	+4·991	+26·28	+ 5·74
	116	ε			·69990	30 53·54	23 16·43	—6·826	+5·021	+26·40	+ 5·35
IV₅	117*	η	June 28 ...	A	·41717	299 24 38·99	— 6 18 9·35	+6·212	+5·140	+26·54	+ 5·42
	117	ζ			·42196	24 36·45	18 7·32	+6·014	+4·940	+26·75	+ 5·82
	118	ζ			·42642	24 34·08	18 5·43	+5·844	+4·921	+26·75	+ 5·82
	119	η			·43060	24 31·86	18 3·67	+5·682	+4·904	+26·54	+ 5·42
	120	η	(1)		·43424	24 29·93	18 2·13	+5·534	+4·892	+26·54	+ 5·42
	121	ζ			·43846	24 27·69	18 0·34	+5·362	+4·875	+26·76	+ 5·82
	122	ζ			·44329	24 25·12	17 58·30	+5·161	+4·859	+26·76	+ 5·82
	123	η			·44756	24 22·85	17 56·49	+4·981	+4·845	+26·55	+ 5·42
IV₆	124	γ	June 28 ...	G	·65154	299 22 33·92	— 6 16 30·47	—5·178	+4·867	+26·66	+ 5·37
	125	λ			·67332	22 22·23	16 21·32	—6·046	+4·951	+26·56	+ 5·86
	126	λ			·68374	22 16·63	16 16·94	—6·421	+4·997	+26·56	+ 5·86
	127	γ			·69321	22 11·55	16 12·97	—6·741	+5·039	+26·67	+ 5·37
	128	γ	(1)		·69845	22 8·73	16 10·77	—6·908	+5·064	+26·67	+ 5·37
	129	λ			·70741	22 3·92	16 7·00	—7·172	+5·107	+26·57	+ 5·86
	130	λ			·71202	22 1·44	16 5·07	—7·303	+5·130	+26·57	+ 5·86
	131	γ			·71823	21 58·10	16 2·46	—7·468	+5·162	+26·68	+ 5·37
IV₇	132	η	June 29 ...	G	·41329	299 15 38·60	— 6 11 14·01	+6·241	+4·997	+26·81	+ 5·55
	133	ζ			·42015	15 34·80	11 11·19	+5·987	+4·968	+27·03	+ 5·94
	134	ζ			·42562	15 31·77	11 8·95	+5·777	+4·947	+27·03	+ 5·94
	135	η			·43352	15 27·39	11 5·71	+5·460	+4·918	+26·82	+ 5·55
	136	η	(1)		·43914	15 24·28	11 3·41	+5·227	+4·899	+26·82	+ 5·55
	137	ζ			·44649	15 20·20	11 0·39	+4·910	+4·872	+27·04	+ 5·94
	138	ζ			·45304	15 16·56	10 57·71	+4·620	+4·852	+27·04	+ 5·94
	139	η			·46180	15 11·70	10 54·12	+4·220	+4·825	+26·82	+ 5·55
IV₈	140	γ	June 29 ...	A	·64661	299 13 28·70	— 6 9 38·62	—5·122	+4·898	+26·93	+ 5·50
	141	λ			·65455	13 24·27	9 35·39	—5·456	+4·925	+26·84	+ 5·97
	142	λ			·65887	13 21·85	9 33·63	—5·631	+4·941	+26·84	+ 5·97
	143	γ			·66503	13 18·40	9 31·12	—5·874	+4·965	+26·94	+ 5·50
	144	γ	(1)		·66954	13 15·87	9 29·29	—6·048	+4·983	+26·94	+ 5·50
	145	λ			·67646	13 12·00	9 26·47	—6·303	+5·013	+26·85	+ 5·98
	146	λ			·68193	13 8·93	9 24·25	—6·497	+5·038	+26·85	+ 5·98
	147	γ			·68936	13 4·77	9 21·22	—6·747	+5·070	+26·95	+ 5·50

IV₅ No. 117*. Seconds of Apparent Declination should be 4″·41 instead of 4″·21. The error was discovered on revisal for discussion with Ephemeris II. and is corrected in that discussion.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
109	ε	158° 17′	4247″·074	2″·158	4249″·232	4249″·950	— 0″·718	+ 0·370	— 0·929	— 0·637
110	λ	309 3	5425·415	3·114	5428·529	5428·048	+ 0·481	— 0·777	+ 0·630	+ 0·728
111	λ	309 3	5430·432	3·329	5433·761	5432·700	+ 1·061	— 0·777	+ 0·630	+ 0·751
112	ε	158 23	4233·087	2·556	4235·643	4236·254	— 0·611	+ 0·368	— 0·930	— 0·677
113	ε	158 25	4229·762	2·665	4232·427	4233·376	— 0·949	+ 0·368	— 0·930	— 0·684
114	λ	309 3	5442·546	4·171	5446·717	5446·170	+ 0·547	— 0·777	+ 0·630	+ 0·811
115	λ	309 3	5445·795	4·463	5450·258	5449·630	+ 0·628	— 0·777	+ 0·630	+ 0·824
116	ε	158 30	4217·866	3·274	4221·140	4221·849	— 0·709	+ 0·367	— 0·930	— 0·716
117*	η	177 17	4904·232	2·217	4906·449	4907·137	— 0·688	+ 0·047	— 0·999	— 0·464
117	ζ	4 29	6143·180	2·889	6146·069	6144·887	+ 1·182	+ 0·078	+ 0·997	+ 0·540
118	ζ	4 27	6145·657	2·823	6148·480	6146·554	+ 1·926	+ 0·078	+ 0·997	+ 0·537
119	η	177 23	4898·783	2·080	4900·863	4901·349	— 0·486	+ 0·046	— 0·999	— 0·463
120	η	177 24	4897·195	2·059	4899·254	4899·726	— 0·472	+ 0·045	— 0·999	— 0·464
121	ζ	4 23	6149·776	2·670	6152·446	6151·063	+ 1·383	+ 0·076	+ 0·997	+ 0·527
122	ζ	4 22	6151·181	2·619	6153·800	6152·865	+ 0·935	+ 0·076	+ 0·997	+ 0·524
123	η	177 29	4890·868	1·978	4892·846	4893·794	— 0·948	+ 0·044	— 0·999	— 0·462
124	γ	159 21	6384·652	3·318	6387·970	6388·927	— 0·957	+ 0·353	— 0·936	— 0·638
125	λ	309 4	6106·692	4·096	6110·788	6109·886	+ 0·902	— 0·776	+ 0·630	+ 0·777
126	λ	309 4	6113·426	4·640	6118·066	6117·285	— 0·781	— 0·776	+ 0·630	+ 0·810
127	γ	159 30	6357·554	4·785	6362·339	6364·013	— 1·674	+ 0·350	— 0·937	— 0·707
128	γ	159 31	6354·842	5·108	6359·950	6360·893	— 0·943	+ 0·350	— 0·937	— 0·714
129	λ	309 3	6128·018	6·567	6134·585	6134·011	+ 0·574	— 0·777	+ 0·630	+ 0·876
130	λ	309 3	6130·937	7·116	6138·053	6137·259	+ 0·794	— 0·777	+ 0·630	+ 0·887
131	γ	159 35	6341·210	6·874	6348·084	6349·121	— 1·037	+ 0·349	— 0·937	— 0·742
132	η	183 54	4493·994	2·253	4496·247	4497·060	— 0·813	— 0·068	— 0·998	— 0·541
133	ζ	359 30	6540·179	2·830	6543·009	6542·384	+ 0·625	— 0·009	+ 1·000	+ 0·492
134	ζ	359 28	6542·419	2·764	6545·183	6544·632	+ 0·551	— 0·009	+ 1·000	+ 0·490
135	η	184 4	4486·600	2·023	4488·623	4489·690	— 1·067	— 0·071	— 0·997	— 0·530
136	η	184 7	4484·866	1·976	4486·842	4487·651	— 0·809	— 0·072	— 0·997	— 0·527
137	ζ	359 22	6551·182	2·580	6553·762	6553·238	+ 0·524	— 0·011	+ 1·000	+ 0·482
138	ζ	359 20	6554·131	2·539	6556·670	6555·941	+ 0·729	— 0·012	+ 1·000	+ 0·479
139	η	184 18	4476·670	1·831	4478·501	4479·446	— 0·945	— 0·075	— 0·997	— 0·513
140	γ	162 56	5820·008	2·916	5822·924	5823·577	— 0·653	+ 0·293	— 0·956	— 0·617
141	λ	308 53	6777·585	3·873	6781·458	6780·624	+ 0·834	— 0·778	+ 0·628	+ 0·731
142	λ	308 53	6780·528	4·037	6784·565	6783·736	+ 0·829	— 0·778	+ 0·628	+ 0·745
143	γ	163 1	5808·990	3·289	5812·279	5813·114	— 0·835	+ 0·292	— 0·956	— 0·644
144	γ	163 2	5806·945	3·406	5810·351	5810·566	— 0·215	+ 0·292	— 0·957	— 0·652
145	λ	308 52	6793·040	4·897	6797·937	6796·417	+ 1·520	— 0·779	+ 0·628	+ 0·803
146	λ	308 52	6796·324	5·243	6801·567	6800·359	+ 1·208	— 0·779	+ 0·628	+ 0·820
147	γ	163 7	5795·108	4·100	5799·208	5799·341	— 0·133	+ 0·290	— 0·957	— 0·679

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	148	ε	June 30.....	A	·40874	299 6 16·00	− 6 4 32·15	+6·320	+5·036	+27·14	+ 5·69
	149	δ			·41404	6 12·95	4 30·05	+6·126	+5·014	+27·25	+ 5·86
	150	δ			·41734	6 11·04	4 28·74	+6·000	+5·001	+27·25	+ 5·86
	151	ε			·42345	6 7·53	4 26·31	+5·762	+4·978	+27·14	+ 5·70
IV_9	152	ε	(1)		·42882	6 4·43	4 24·18	+5·546	+4·957	+27·14	+ 5·70
	153	δ			·43391	6 1·49	4 22·16	+5·335	+4·940	+27·25	+ 5·86
	154	δ			·43714	5 59·63	4 20·88	+5·198	+4·929	+27·25	+ 5·86
	155	ε			·44251	5 56·53	4 18·75	+4·967	+4·911	+27·15	+ 5·70
	156	y	June 30.....	G	·64829	299 3 57·36	− 6 2 57·44	−5·348	+4·949	+27·32	+ 5·62
	157	θ			·65889	3 51·20	2 53·27	−5·784	+4·988	+27·21	+ 5·98
	158	θ			·66457	3 47·89	2 51·03	−6·006	+5·009	+27·21	+ 5·98
	159	y			·67440	3 42·17	2 47·16	−6·369	+5·050	+27·33	+ 5·62
IV_{10}	160	y	(1)		·68446	3 36·32	2 43·21	−6·718	+5·095	+27·33	+ 5·62
	161	θ			·69360	3 31·00	2 39·62	−7·010	+5·151	+27·22	+ 5·98
	162	θ			·69915	3 27·77	2 37·44	−7·178	+5·162	+27·22	+ 5·98
	163	y			·70677	3 23·33	2 34·44	−7·391	+5·200	+27·34	+ 5·62
	164	ε	July 1	G	·41219	298 56 27·06	− 5 58 0·72	+6·100	+5·042	+27·40	+ 5·82
	165	δ			·42814	56 17·52	57 54·61	+5·466	+4·982	+27·52	+ 5·98
IV_{11}	166	δ	(3)		·43870	56 11·21	57 50·56	+5·010	+4·947	+27·52	+ 5·98
	167	ε			·48595	55 42·94	57 32·50	+2·752	+4·827	+27·41	+ 5·83
	168	y	July 1	A	·65865	298 53 59·21	− 5 56 26·69	−5·921	+5·031	+27·58	+ 5·75
	169	θ			·66554	53 55·05	56 24·08	−6·182	+5·058	+27·48	+ 6·10
	170	θ			·66976	53 52·51	56 22·48	−6·338	+5·075	+27·48	+ 6·10
	171	y			·67610	53 48·69	56 20·07	−6·564	+5·103	+27·59	+ 5·75
IV_{12}	172	y	(2)		·68159	53 45·38	56 17·99	−6·753	+5·127	+27·59	+ 5·75
	173	θ			·68849	53 41·22	56 15·38	−6·976	+5·158	+27·48	+ 6·10
	174	θ			·69209	53 39·04	56 14·01	−7·088	+5·176	+27·48	+ 6·10
	175	y			·70287	53 32·54	56 9·93	−7·399	+5·226	+27·60	+ 5·75
	176	η	July 2	A	·39917	298 46 27·60	− 5 51 49·40	+6·484	+5·114	+27·60	+ 5·92
	177	α			·40719	46 22·66	51 46·44	+6·189	+5·080	+27·87	+ 6·03
	178	α			·41045	46 20·64	51 45·23	+6·066	+5·069	+27·87	+ 6·03
	179	η			·41547	46 17·55	51 43·38	+5·867	+5·049	+27·60	+ 5·92
IV_{13}	180	η	(2)		·41936	46 15·14	51 41·95	+5·712	+5·035	+27·60	+ 5·92
	181	α			·42403	46 12·26	51 40·22	+5·523	+5·019	+27·87	+ 6·03
	182	α			·42855	46 9·46	51 38·55	+5·330	+5·003	+27·87	+ 6·03
	183	η			·43485	46 5·57	51 36·23	+5·061	+4·981	+27·61	+ 5·93

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
148	ε	178 10	2804·030	1·290	2805·320	2805·577	− 0·257	+ 0·032	− 0·999	− 0·483
149	δ	16 39	2273·038	1·296	2274·334	2273·523	+ 0·811	+ 0·287	+ 0·958	+ 0·655
150	δ	16 36	2273·695	1·261	2274·956	2274·189	+ 0·767	+ 0·286	+ 0·958	+ 0·649
151	ε	178 21	2797·080	1·206	2798·286	2799·537	− 1·251	+ 0·029	− 1·000	− 0·481
152	ε	178 25	2795·206	1·184	2796·390	2797·335	− 0·945	+ 0·028	− 1·000	− 0·480
153	δ	16 18	2277·208	1·128	2278·336	2277·568	+ 0·768	+ 0·281	+ 0·960	+ 0·623
154	δ	16 15	2277·966	1·106	2279·072	2278·230	+ 0·842	+ 0·280	+ 0·960	+ 0·618
155	ε	178 35	2789·892	1·137	2791·029	2791·735	− 0·706	+ 0·025	− 1·000	− 0·479
156	y	131 49	5760·794	3·402	5764·196	5765·323	− 1·127	+ 0·745	− 0·667	− 0·726
157	θ	317 10	4175·039	2·588	4177·627	4177·400	+ 0·227	− 0·680	+ 0·733	+ 0·757
158	θ	317 9	4178·741	2·746	4181·487	4181·452	+ 0·035	− 0·680	+ 0·733	+ 0·773
159	y	131 51	5741·036	4·536	5745·572	5746·381	− 0·809	+ 0·745	− 0·667	− 0·809
160	y	131 52	5733·435	5·195	5738·630	5739·118	− 0·488	+ 0·745	− 0·667	− 0·838
161	θ	317 4	4198·448	3·978	4202·426	4202·023	+ 0·403	− 0·681	+ 0·732	+ 0·852
162	θ	317 4	4201·934	4·340	4206·274	4205·928	+ 0·346	− 0·681	+ 0·732	+ 0·864
163	y	131 53	5714·771	7·493	5722·264	5723·074	− 0·810	+ 0·745	− 0·668	− 0·895
164	ε	191 38	2460·974	1·328	2462·302	2463·448	− 1·146	− 0·202	− 0·980	− 0·617
165	δ	1 19	2573·783	1·095	2574·878	2574·087	+ 0·791	+ 0·023	+ 1·000	+ 0·511
166	δ	1 10	2577·470	1·059	2578·529	2577·961	+ 0·568	+ 0·020	+ 1·000	+ 0·505
167	ε	192 51	2444·207	0·962	2445·169	2446·104	− 0·935	− 0·222	− 0·975	− 0·531
168	y	133 1	5057·946	3·430	5061·376	5061·865	− 0·489	+ 0·731	− 0·682	− 0·773
169	θ	315 9	4866·725	3·355	4870·080	4869·184	+ 0·896	− 0·705	+ 0·709	+ 0·792
170	θ	315 9	4868·985	3·527	4872·512	4872·226	+ 0·286	− 0·705	+ 0·709	+ 0·804
171	y	133 3	5044·598	4·221	5048·819	5049·179	− 0·360	+ 0·731	− 0·683	− 0·825
172	y	133 4	5039·867	4·553	5044·420	5045·195	− 0·775	+ 0·731	− 0·683	− 0·841
173	θ	315 6	4881·520	4·530	4886·050	4885·683	+ 0·367	− 0·706	+ 0·708	+ 0·855
174	θ	315 6	4884·270	4·771	4889·041	4888·274	+ 0·767	− 0·706	+ 0·708	+ 0·865
175	y	133 6	5022·231	6·439	5028·670	5029·807	− 1·137	+ 0·730	− 0·683	− 0·894
176	η	211 41	3900·640	2·883	3903·523	3904·001	− 0·478	− 0·525	− 0·851	− 0·773
177	α	41 11	3756·320	2·552	3758·872	3758·020	+ 0·852	+ 0·659	+ 0·753	+ 0·789
178	α	41 9	3756·162	2·466	3758·628	3757·524	+ 1·104	+ 0·658	+ 0·753	+ 0·780
179	η	211 52	3901·590	2·437	3904·027	3904·523	− 0·496	− 0·528	− 0·849	− 0·737
180	η	211 54	3901·485	2·353	3903·838	3904·667	− 0·829	− 0·528	− 0·849	− 0·728
181	α	41 0	3753·866	2·160	3756·026	3755·434	+ 0·692	+ 0·656	+ 0·755	+ 0·739
182	α	40 57	3753·489	2·076	3755·565	3754·732	+ 0·833	+ 0·655	+ 0·755	+ 0·726
183	η	212 4	3902·576	2·077	3904·653	3905·273	− 0·620	− 0·531	− 0·847	− 0·689

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	184	γ	July 2	G	·64964	298 43 52·42	— 5 50 17·34	—5·708	+5·040	+27·84	+ 5·86
	185	θ			·65871	43 46·78	50 14·02	—6·068	+5·076	+27·73	+ 6·22
	186	θ			·67036	43 39·53	50 9·77	—6·498	+5·123	+27·73	+ 6·22
	187	γ			·67839	43 34·53	50 6·84	—6·778	+5·157	+27·85	+ 5·87
IV_{14}	188	γ	(3)		·68435	43 30·82	50 4·66	—6·971	+5·184	+27·85	+ 5·87
	189	θ			·69208	43 26·01	50 1·84	—7·211	+5·220	+27·74	+ 6·22
	190	θ			·69981	43 21·19	49 59·02	—7·430	+5·256	+27·74	+ 6·22
	191	γ			·71037	43 14·61	49 55·16	—7·703	+5·306	+27·85	+ 5·87
	192	β	July 3	A	·63509	298 33 30·42	— 5 44 23·95	—5·253	+5·034	+28·03	+ 5·97
	193	δ			·64115	33 26·55	44 21·82	—5·512	+5·052	+28·09	+ 6·23
	194	δ			·64501	33 24·08	44 20·46	—5·671	+5·066	+28·09	+ 6·23
	195	β			·65076	33 20·40	44 18·45	—5·904	+5·088	+28·03	+ 5·97
V_{1}:	196	β	(3)		·65642	33 16·77	44 16·46	—6·125	+5·107	+28·03	+ 5·97
	197	δ			·66205	33 13·16	44 14·48	—6·337	+5·129	+28·09	+ 6·24
	198	δ			·66635	33 10·41	44 12·97	—6·493	+5·148	+28·09	+ 6·24
	199	β			·67314	33 6·05	44 10·59	—6·730	+5·176	+28·03	+ 5·98
	200	γ	July 4	A	·39418	298 25 19·38	— 5 40 1·37	+6·475	+5·166	+28·14	+ 6·10
	201	α			·39920	25 16·10	39 59·66	+6·292	+5·145	+28·36	+ 6·25
	202	α			·40287	25 13·70	39 58·42	+6·153	+5·128	+28·36	+ 6·25
	203	γ			·40650	25 11·33	39 57·18	+6·008	+5·118	+28·14	+ 6·10
V_{2}:	204	γ	(1)		·41049	25 8·72	39 55·83	+5·851	+5·102	+28·14	+ 6·10
	205	α			·41583	25 5·23	39 54·01	+5·630	+5·085	+28·36	+ 6·26
	206	α			·41906	25 3·11	39 52·91	+5·467	+5·073	+28·36	+ 6·26
	207	γ			·42517	24 59·12	39 50·83	+5·231	+5·052	+28·15	+ 6·11
	208		July 4	G							
	209	δ			·64361	298 22 35·83	— 5 38 36·93	—5·762	+5·103	+28·33	+ 6·35
	210	δ			·64961	22 31·88	38 34·91	—6·001	+5·124	+28·33	+ 6·35
	211										
V_{3}	212										
	213	δ			·68073	22 11·41	38 24·45	—7·106	+5·251	+28·34	+ 6·36
	214	δ			·68554	22 8·24	38 22·83	—7·253	+5·272	+28·34	+ 6·36
	215										
	222	ε	July 5	G	·45952	298 13 33·77	— 5 34 7·18	+3·480	+4·981	+28·53	+ 6·27
	223	ε			·46591	13 29·48	34 5·11	+3·158	+4·969	+28·53	+ 6·27
V_{4}	224	ε	(1)		·46870	13 27·61	34 4·20	+3·017	+4·963	+28·53	+ 6·27
	225	ε			·47312	13 24·64	34 2·77	+2·788	+4·956	+28·53	+ 6·27

V_3 Nos. 208, 211, 212, 215. The star D. M. — 4° No. 4982 was observed instead of β.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
184	γ	134 53	4367·299	2·733	4370·032	4370·801	− 0·769	+ 0·709	− 0·706	− 0·759
185	θ	313 25	5557·223	3·620	5560·843	5560·663	+ 0·180	− 0·726	+ 0·687	+ 0·789
186	θ	313 24	5565·335	4·142	5569·477	5569·158	+ 0·319	− 0·727	+ 0·687	+ 0·823
187	γ	134 57	4345·353	3·825	4349·178	4349·942	− 0·764	+ 0·708	− 0·707	− 0·842
188	γ	134 58	4340·787	4·168	4344·955	4345·641	− 0·686	+ 0·708	− 0·707	− 0·857
189	θ	313 22	5579·395	5·622	5585·017	5584·967	+ 0·050	− 0·727	+ 0·687	+ 0·880
190	θ	313 21	5584·805	6·406	5591·211	5590·575	+ 0·636	− 0·727	+ 0·686	+ 0·898
191	γ	135 2	4319·135	6·630	4325·765	4326·910	− 1·145	+ 0·707	− 0·708	− 0·917
192	β	160 17	4149·208	2·158	4151·366	4152·144	− 0·778	+ 0·337	− 0·941	− 0·649
193	δ	338 46	3631·096	1·924	3633·020	3632·533	+ 0·487	− 0·362	+ 0·932	+ 0·669
194	δ	338 44	3633·095	1·976	3635·071	3634·767	+ 0·304	− 0·363	+ 0·932	+ 0·678
195	β	160 24	4139·908	2·405	4142·313	4143·332	− 1·019	+ 0·336	− 0·942	− 0·676
196	β	160 26	4136·485	2·516	4139·001	4140·150	− 1·149	+ 0·335	− 0·942	− 0·685
197	δ	338 36	3642·473	2·281	3644·754	3644·574	+ 0·180	− 0·365	+ 0·931	+ 0·708
198	δ	338 34	3645·023	2·381	3647·403	3647·052	+ 0·351	− 0·365	+ 0·931	+ 0·715
199	β	160 33	4126·916	2·948	4129·864	4130·797	− 0·933	+ 0·333	− 0·943	− 0·711
200	γ	196 59	3959·638	2·470	3962·108	3962·801	− 0·693	− 0·292	− 0·956	− 0·682
201	α	18 58	3736·443	2·191	3738·634	3738·050	+ 0·584	+ 0·325	+ 0·946	+ 0·689
202	α	18 56	3737·868	2·126	3739·994	3738·381	+ 1·613	+ 0·325	+ 0·946	+ 0·684
203	γ	197 7	3958·011	2·227	3960·238	3961·331	− 1·093	− 0·294	− 0·956	− 0·665
204	γ	197 9	3958·102	2·161	3960·263	3960·874	− 0·611	− 0·295	− 0·956	− 0·660
205	α	18 47	3739·128	1·928	3741·056	3739·621	+ 1·435	+ 0·322	+ 0·947	+ 0·662
206	α	18 45	3739·097	1·888	3740·985	3739·915	+ 1·070	+ 0·321	+ 0·947	+ 0·654
207	γ	197 19	3956·628	1·964	3958·592	3959·175	− 0·583	− 0·298	− 0·955	− 0·637
208										
209	δ	332 15	4213·153	2·430	4215·583	4215·708	− 0·125	− 0·466	+ 0·885	+ 0·718
210	δ	332 13	4217·343	2·561	4219·904	4219·456	+ 0·448	− 0·466	+ 0·885	+ 0·731
211										
212										
213	δ	332 1	4235·789	3·645	4239·434	4238·847	+ 0·587	− 0·469	+ 0·883	+ 0·796
214	δ	332 0	4238·235	3·906	4242·141	4241·839	+ 0·302	− 0·470	+ 0·883	+ 0·804
215										
222	ε	112 54	795·136	0·231	795·367	795·682	− 0·315	+ 0·921	− 0·389	+ 0·125
223	ε	112 53	789·708	0·227	789·935	790·654	− 0·719	+ 0·921	− 0·389	+ 0·097
224	ε	112 53	788·218	0·225	788·443	788·461	− 0·018	+ 0·921	− 0·389	+ 0·084
225	ε	112 53	784·618	0·225	784·843	784·971	− 0·128	+ 0·921	− 0·389	+ 0·063

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
V_5	231	z	July 5	A	·68446	298 11 2·46	− 5 32 54·56	−7·341	+5·324	+28·59	+ 6·30
	232	z	(3)		·68891	10 59·46	32 53·14	−7·467	+5·326	+28·59	+ 6·30
	233	z			·69384	10 56·14	32 51·55	−7·603	+5·348	+28·59	+ 6·30
	234	z			·69771	10 53·53	32 50·31	−7·702	+5·368	+28·59	+ 6·30
V_6	236	y	July 8.....	A	·38715	297 39 48·16	− 5 19 22·17	+6·321	+5·239	+29·16	+ 6·56
	237	z	(1)		·39316	39 43·88	19 20·49	+6·085	+5·219	+29·19	+ 6·60
	238	x			·39862	39 40·00	19 18·96	+5·865	+5·200	+29·25	+ 6·53
	239	x			·40213	39 37·51	19 17·98	+5·719	+5·188	+29·25	+ 6·53
	240	z			·40631	39 34·53	19 16·81	+5·543	+5·175	+29·19	+ 6·61
	241	y			·41066	39 31·44	19 15·59	+5·356	+5·162	+29·17	+ 6·57
	242	y			·41516	39 28·24	19 14·33	+5·157	+5·147	+29·17	+ 6·57
	243	z			·41936	39 25·26	19 13·16	+4·970	+5·136	+29·20	+ 6·61
	244	x			·42455	39 21·57	19 11·71	+4·733	+5·119	+29·26	+ 6·53
	245	x			·42827	39 18·92	19 10·67	+4·557	+5·112	+29·26	+ 6·53
	246	z			·43275	39 15·74	19 9·42	+4·343	+5·100	+29·20	+ 6·61
	247	y			·43696	39 12·74	19 8·25	+4·143	+5·089	+29·17	+ 6·57
VI_1	248	x	July 10.....	A	·36133	297 16 3·24	− 5 10 40·18	+7·039	+5·354	+29·65	+ 6·75
	249	x	(2)		·36496	16 0·59	10 39·28	+6·917	+5·338	+29·65	+ 6·75
	250	x			·36860	15 57·93	10 38·37	+6·790	+5·325	+29·65	+ 6·75
	251	x			·37149	15 55·81	10 37·65	+6·686	+5·313	+29·65	+ 6·75
	254	x			·40175	15 33·66	10 30·13	+5·481	+5·210	+29·66	+ 6·76
	255	x			·40413	15 31·92	10 29·54	+5·379	+5·202	+29·66	+ 6·76
	256	x			·40707	15 29·76	10 28·81	+5·246	+5·194	+29·66	+ 6·76
	257	x			·41061	15 27·17	10 27·93	+5·089	+5·184	+29·66	+ 6·76
	258	x			·41498	15 23·97	10 26·85	+4·888	+5·171	+29·66	+ 6·76
	259	x			·41751	15 22·12	10 26·22	+4·775	+5·165	+29·66	+ 6·76
VI_2	262	x	July 11.....	A	·63089	297 0 27·40	− 5 5 36·90	−6·270	+5·293	+29·79	+ 6·89
	263	x	(3)		·63562	0 23·89	5 35·81	−6·451	+5·311	+29·79	+ 6·89
	264	w			·64529	0 16·71	5 33·60	−6·805	+5·346	+29·87	+ 6·85
	265	w			·65724	0 7·85	5 30·87	−7·208	+5·393	+29·87	+ 6·85
	266	w			·67077	296 59 57·80	5 27·79	−7·613	+5·450	+29·87	+ 6·85
	267	w			·67473	59 54·86	5 26·89	−7·722	+5·466	+29·88	+ 6·86
	268	x			·69501	59 39·79	5 22·26	−8·196	+5·555	+29·80	+ 6·90
	269	x			·70260	59 34·15	5 20·53	−8·341	+5·592	+29·80	+ 6·90

V_5 Rejected in consequence of abnormally bad images—scarcely visible.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
		° ′	″	″	″	″	″			
231	z	112 29	617·883	0·675	618·558	618·615	− 0·057	+ 0·924	− 0·382	− 0·878
232	z	112 29	614·048	0·727	614·775	615·180	− 0·405	+ 0·924	− 0·382	− 0·891
233	z	112 28	610·469	0·794	611·263	611·401	− 0·138	+ 0·924	− 0·382	− 0·903
234	z	112 27	607·293	0·854	608·147	608·427	− 0·280	+ 0·924	− 0·382	− 0·913
236	y	210 21	1422·862	0·971	1423·833	1424·814	− 0·981	− 0·505	− 0·863	− 0·769
237	z	294 10	1409·269	0·498	1409·767	1409·337	+ 0·430	− 0·912	+ 0·409	− 0·339
238	x	88 52	2011·344	0·972	2012·316	2012·704	− 0·388	+ 1·000	+ 0·020	+ 0·594
239	x	88 51	2009·450	0·939	2010·389	2010·095	+ 0·294	+ 1·000	+ 0·020	+ 0·580
240	z	294 8	1419·969	0·469	1420·438	1419·817	+ 0·621	− 0·913	+ 0·409	− 0·292
241	y	211 5	1426·465	0·789	1427·254	1428·231	− 0·977	− 0·516	− 0·857	− 0·718
242	y	211 14	1427·057	0·764	1427·821	1428·916	− 1·095	− 0·519	− 0·855	− 0·707
243	z	294 7	1430·057	0·446	1430·503	1430·243	+ 0·260	− 0·913	+ 0·409	− 0·242
244	x	88 39	1992·505	0·774	1993·279	1993·371	− 0·092	+ 1·000	+ 0·024	+ 0·483
245	x	88 37	1989·969	0·753	1990·722	1990·590	+ 0·132	+ 1·000	+ 0·024	+ 0·465
246	z	294 5	1440·918	0·431	1441·349	1440·979	+ 0·370	− 0·913	+ 0·408	− 0·187
247	y	211 55	1431·028	0·666	1431·694	1432·402	− 0·708	− 0·529	− 0·849	− 0·650
248	x	47 11	820·807	0·772	821·579	821·410	+ 0·169	+ 0·734	+ 0·680	+ 0·879
249	x	47 0	820·043	0·731	820·774	819·996	+ 0·778	+ 0·731	+ 0·682	+ 0·868
250	x	46 50	818·281	0·695	818·976	818·582	+ 0·394	+ 0·729	+ 0·684	+ 0·857
251	x	46 41	817·308	0·668	817·976	817·451	+ 0·525	+ 0·728	+ 0·686	+ 0·849
254	x	45 10	806·003	0·475	806·478	805·886	+ 0·592	+ 0·709	+ 0·705	+ 0·754
255	x	45 3	805·034	0·461	805·495	804·997	+ 0·498	+ 0·708	+ 0·707	+ 0·747
256	x	44 54	804·154	0·448	804·602	803·895	+ 0·707	+ 0·706	+ 0·708	+ 0·736
257	x	44 43	802·636	0·436	803·072	802·583	+ 0·489	+ 0·704	+ 0·711	+ 0·725
258	x	44 29	801·155	0·420	801·575	800·968	+ 0·607	+ 0·701	+ 0·713	+ 0·710
259	x	44 21	800·249	0·412	800·661	800·052	+ 0·609	+ 0·699	+ 0·715	+ 0·701
262	x	338 18	927·385	0·565	927·950	927·092	+ 0·858	− 0·370	+ 0·929	+ 0·722
263	x	338 7	929·818	0·594	930·412	929·487	+ 0·925	− 0·373	+ 0·928	+ 0·733
264	w	150 49	963·800	0·742	964·542	965·236	− 0·694	+ 0·488	− 0·873	− 0·798
265	w	151 13	956·580	0·857	957·437	958·344	− 0·907	+ 0·482	− 0·876	− 0·818
266	w	151 41	948·539	1·047	949·586	950·611	− 1·025	+ 0·474	− 0·880	− 0·839
267	w	151 49	946·584	1·117	947·701	948·367	− 0·666	+ 0·472	− 0·881	− 0·845
268	x	335 53	959·394	1·602	960·996	960·031	+ 0·965	− 0·409	+ 0·913	+ 0·841
269	x	335 37	963·280	1·970	965·250	963·999	+ 1·251	− 0·413	+ 0·911	+ 0·852

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VII$_1$	272	u	July 16.....	G	·63022	295 57 31·18	− 4 49 53·63	−6·891	+5·408	+30·74	+ 7·31
	273	u			·63655	57 26·35	49 52·70	−7·108	+5·431	+30·74	+ 7·31
	274	u	(1)		·64675	57 18·58	49 51·19	−7·433	+5·472	+30·74	+ 7·31
	275	u			·65496	57 12·31	49 49·97	−7·672	+5·505	+30·74	+ 7·31
	276	u			·66890	57 1·68	49 47·91	−8·029	+5·563	+30·74	+ 7·31
	277	u			·67920	56 53·83	49 46·39	−8·256	+5·606	+30·74	+ 7·31
VII$_2$	286	t	July 17.....	G	·39436	295 47 48·41	− 4 48 5·09	+4·811	+5·258	+30·85	+ 7·38
	287	t	(2)		·40023	47 43·94	48 4·29	+4·532	+5·243	+30·85	+ 7·38
	288	t			·40691	47 38·85	48 3·38	+4·207	+5·228	+30·85	+ 7·38
	289	t			·41447	47 33·09	48 2·35	+3·830	+5·211	+30·85	+ 7·38
VII$_3$	292–3	t	July 17.....	A	·62549	295 44 52·22	− 4 47 34·12	−6·843	+5·410	+30·88	+ 7·40
	298	t	(3)		·64683	44 35·95	47 31·30	−7·535	+5·492	+30·89	+ 7·40
	299	t			·65101	44 32·76	47 30·75	−7·655	+5·508	+30·89	+ 7·40
	300	t			·65582	44 29·10	47 30·11	−7·791	+5·529	+30·89	+ 7·40
	301	t			·66021	44 25·75	47 29·53	−7·902	+5·546	+30·89	+ 7·40
VII$_4$	304	t	July 18.....	A	·33905	295 35 48·55	− 4 46 3·96	+6·951	+5·424	+30·99	+ 7·47
	305	t	(1)		·34266	35 45·80	46 3·53	+6·823	+5·411	+30·99	+ 7·47
	306	t			·34625	35 43·07	46 3·09	+6·692	+5·399	+30·99	+ 7·47
	307	t			·34994	35 40·26	46 2·65	+6·558	+5·386	+30·99	+ 7·47
VII$_5$	319	t	July 18.....	G	·64658	295 31 54·56	− 4 45 27·65	−7·627	+5·508	+31·02	+ 7·50
	320	t	(1)		·65033	31 51·71	45 27·22	−7·733	+5·522	+31·02	+ 7·50
	321	t			·65462	31 48·45	45 26·72	−7·847	+5·538	+31·02	+ 7·50
	322	t			·66092	31 43·66	45 25·99	−8·002	+5·565	+31·02	+ 7·50
VII$_6$	323	t	July 19.....	G	·31317	295 23 28·27	− 4 44 14·15	+7·657	+5·514	+31·11	+ 7·57
	324	q			·31992	23 23·15	44 13·44	+7·462	+5·486	+31·12	+ 7·49
	325	q			·32444	23 19·72	44 12·97	+7·324	+5·469	+31·12	+ 7·49
	326	t	(1)		·33116	23 14·62	44 12·26	+7·114	+5·444	+31·11	+ 7·57
	327	t			·33646	23 10·59	44 11·70	+6·923	+5·423	+31·11	+ 7·57
	328	q			·34183	23 6·52	44 11·14	+6·732	+5·405	+31·12	+ 7·49
	329	q			·34575	23 3·55	44 10·74	+6·587	+5·392	+31·12	+ 7·49
	330	t			·35053	22 59·93	44 10·24	+6·406	+5·376	+31·12	+ 7·57

VII$_{2\,\&\,3}$. In the original notes these stars are sketched showing that the image of the artificial double star formed in crossing through is at right angles to the line joining the other images of the planet and comparison star, which (the distance being small) are simultaneously visible in the field. The correction for ψ is therefore zero. (*See* Triangulation, p. 237.)

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
272	u	148 8	105·086	0·088	105·174	106·247		+ 0·528	— 0·849	— 0·821
273	u	150 15	101·795	0·091	101·886	102·853		+ 0·496	— 0·868	— 0·822
274	u	153 54	97·114	0·097	97·211	97·705		+ 0·440	— 0·898	— 0·816
275	u	157 7	96·772	0·099	96·871	93·867	*	+ 0·389	— 0·921	— 0·804
276	u	163 9	88·116	0·106	88·222	88·154		+ 0·290	— 0·957	— 0·764
277	u	168 4	84·358	0·114	84·472	84·629		+ 0·207	— 0·978	— 0·719
286	t	145 24	131·368	0·038	131·406	132·328	— 0·922	+ 0·568	— 0·823	— 0·161
287	t	146 56	127·935	0·037	127·972	129·044	— 1·072	+ 0·546	— 0·838	— 0·193
288	t	148 46	124·138	0·038	124·176	125·413	— 1·237	+ 0·519	— 0·855	— 0·229
289	t	151 0	120·350	0·038	120·388	121·468	— 1·080	+ 0·485	— 0·875	— 0·271
292–3	t	235 13	136·283	0·045	136·328	136·438	— 0·110	— 0·821	— 0·571	+ 0·250
298	t	239 51	148·874	0·065	148·939	149·169	— 0·230	— 0·865	— 0·502	+ 0·374
299	t	240 40	151·289	0·070	151·359	151·750	— 0·391	— 0·872	— 0·490	+ 0·395
300	t	241 34	154·438	0·080	154·518	154·738	— 0·220	— 0·879	— 0·476	+ 0·419
301	t	242 21	157·124	0·088	157·212	157·499	— 0·287†	— 0·886	— 0·464	+ 0·440
304	t	271 6	640·341	0·419	640·760	640·345	+ 0·415	— 1·000	+ 0·019	— 0·683
305	t	271 8	642·886	0·401	643·287	643·222	+ 0·065	— 1·000	+ 0·020	— 0·669
306	t	271 10	645·648	0·383	646·031	646·080	— 0·049	— 1·000	+ 0·020	— 0·656
307	t	271 12	648·858	0·368	649·226	649·019	+ 0·207	— 1·000	+ 0·021	— 0·643
319	t	273 8	888·688	0·877	889·565	889·305	+ 0·260	— 0·998	+ 0·055	+ 0·789
320	t	273 9	891·852	0·944	892·796	892·264	+ 0·532	— 0·998	+ 0·055	+ 0·799
321	t	273 11	894·407	1·034	895·441	895·656	— 0·215	— 0·998	+ 0·056	+ 0·812
322	t	273 12	899·253	1·191	900·444	900·614	— 0·170	— 0·998	+ 0·056	+ 0·827
323	t	275 4	1381·711	1·203	1382·914	1382·797	+ 0·117	— 0·996	+ 0·088	— 0·713
324	q	84 26	1924·769	1·755	1926·524	1927·005	— 0·481	+ 0·995	+ 0·097	+ 0·793
325	q	84 25	1921·669	1·624	1923·233	1923·508	— 0·275	+ 0·995	+ 0·097	+ 0·779
326	t	275 5	1396·200	0·912	1397·112	1397·044	+ 0·068	— 0·996	+ 0·089	— 0·658
327	t	275 6	1400·421	0·850	1401·271	1401·281	— 0·010	— 0·996	+ 0·089	— 0·639
328	q	84 19	1908·426	1·254	1909·680	1910·006	— 0·326	+ 0·995	+ 0·099	+ 0·721
329	q	84 18	1905·254	1·190	1906·444	1906·960	— 0·516	+ 0·995	+ 0·099	+ 0·707
330	t	275 7	1411·871	0·723	1412·594	1412·505	+ 0·089	— 0·996	+ 0·089	— 0·589

* VII_1 The distance was too small to observe in the usual way, and an attempt was made to measure half distances by placing the stars in a line, thus ✱ × ✱ ×, as in double star observing, but the distance was too great for accurate estimation of the middle point.

† VII_3. Rejected for discordance from other data, in first reduction, retained in discussion with Ephemeris II.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VII$_7$	343–4	t	July 19.....	A	·64911	295 19 13·70	− 4 43 39·84	−7·784	+5·531	+31·15	+ 7·60
	345–6	q	(3)		·66193	19 4·00	43 38·56	−8·100	+5·585	+31·16	+ 7·52
	347–8	q			·67861	18 51·37	43 36·92	−8·431	+5·654	+31·16	+ 7·52
VIII$_1$	349	q	July 20.....	A	·31763	295 10 48·53	−4 42 36·96	+7·430	+5·483	+31·25	+ 7·59
	350	q			·32035	10 46·48	42 36·71	+7·344	+5·473	+31·25	+ 7·59
	351	q			·32459	10 43·28	42 36·34	+7·210	+5·458	+31·25	+ 7·59
	352	q			·32893	10 40·01	42 35·95	+7·066	+5·441	+31·25	+ 7·59
	353	q	(2)		·34539	10 27·60	42 34·50	+6·476	+5·383	+31·25	+ 7·59
	354	q			·34775	10 25·82	42 34·29	+6·385	+5·376	+31·25	+ 7·59
	355	q			·35367	10 21·36	42 33·77	+6·150	+5·356	+31·25	+ 7·59
	356	q			·35647	10 19·25	42 33·52	+6·039	+5·348	+31·25	+ 7·59
VIII$_2$	372	q	July 20.....	G	·64235	295 6 43·97	− 4 42 8·99	−7·689	+5·519	+31·28	+ 7·62
	373	q			·64725	6 40·28	42 8·58	−7·821	+5·538	+31·28	+ 7·62
	374	q	(2)		·65321	6 35·80	42 8·09	−7·966	+5·562	+31·28	+ 7·62
	375	q			·66101	6 29·94	42 7·44	−8·150	+5·796	+31·28	+ 7·62
VIII$_3$	376	q	July 21.....	G	·29338	294 58 35·49	− 4 41 18·06	+7·992	+5·566	+31·36	+ 7·69
	377	q			·29676	58 32·96	41 17·82	+7·910	+5·552	+31·36	+ 7·69
	378	q			·30088	58 29·88	41 17·51	+7·806	+5·535	+31·36	+ 7·69
	379	q			·30583	58 26·17	41 17·15	+7·671	+5·517	+31·36	+ 7·69
	380	q	(1)		·31117	58 22·18	41 16·76	+7·518	+5·495	+31·36	+ 7·69
	381	q			·31560	58 18·87	41 16·44	+7·385	+5·477	+31·36	+ 7·69
	382	q			·32323	58 13·16	41 15·88	+7·144	+5·449	+31·36	+ 7·69
	383	q			·32742	58 10·03	41 15·58	+7·004	+5·433	+31·36	+ 7·69
VIII$_4$	400	q	July 21.....	A	·64515	294 54 12·69	− 4 40 53·36	−7·848	+5·541	+31·39	+ 7·72
	401	q			·64917	54 9·70	40 53·09	−7·947	+5·558	+31·39	+ 7·72
	402	q	(2)		·65403	54 6·07	40 52·77	−8·063	+5·579	+31·39	+ 7·72
	403	q			·65776	54 3·30	40 52·52	−8·148	+5·594	+31·39	+ 7·72
VIII$_5$	413	q	July 22.....	A	·34572	294 45 32·06	− 4 40 10·01	+6·196	+5·360	+31·46	+ 7·78
	414	q			·34987	45 28·99	40 9·78	+6·029	+5·347	+31·46	+ 7·78
	415	q	(1)		·35421	45 25·77	40 9·53	+5·848	+5·333	+31·46	+ 7·78
	416	q			·35759	45 23·27	40 9·34	+5·708	+5·322	+31·46	+ 7·78
VIII$_6$	419	q	July 22.....	G	·61783	294 42 10·90	− 4 39 55·26	−7·136	+5·448	+31·49	+ 7·81
	420	q			·62315	42 6·97	39 54·99	−7·306	+5·466	+31·49	+ 7·81
	421	q	(3)		·62930	42 2·43	39 54·67	−7·495	+5·490	+31·49	+ 7·81
	422	q			·63826	41 55·82	39 54·20	−7·748	+5·525	+31·49	+ 7·81

VIII$_6$ Rejected for discordance; apparently some mistake which cannot be discovered.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
343–4	t	275 26	1652·333	1·811	1654·144	1653·930	+ 0·214	− 0·996	+ 0·095	+ 0·826
345–6	q	82 19	1656·575	1·814	1658·389	1659·040	− 0·651	+ 0·991	+ 0·134	− 0·725
347–8	q	82 12	1643·133	2·859	1645·992	1646·472	− 0·480	+ 0·991	+ 0·136	− 0·756
349	q	76 20	1198·209	1·209	1199·418	1199·693	− 0·275	+ 0·972	+ 0·236	+ 0·849
350	q	76 18	1196·615	1·150	1197·765	1197·678	+ 0·087	+ 0·972	+ 0·237	+ 0·841
351	q	76 15	1193·690	1·069	1194·759	1194·539	+ 0·220	+ 0·971	+ 0·238	+ 0·828
352	q	76 12	1190·412	0·999	1191·411	1191·327	+ 0·084	+ 0·971	+ 0·239	+ 0·814
353	q	75 59	1178·306	0·787	1179·093	1179·086	+ 0·007	+ 0·970	+ 0·242	+ 0·757
354	q	75 57	1176·588	0·764	1177·352	1177·329	+ 0·023	+ 0·970	+ 0·243	+ 0·748
355	q	75 52	1171·983	0·709	1172·692	1172·907	− 0·215	+ 0·970	+ 0·244	+ 0·726
356	q	75 50	1169·891	0·687	1170·578	1170·821	− 0·243	+ 0·970	+ 0·245	+ 0·715
372	q	71 3	958·324	0·626	958·950	958·880	+ 0·070	+ 0·946	+ 0·325	− 0·546
373	q	70 58	954·698	0·674	955·372	955·420	− 0·048	+ 0·945	+ 0·326	− 0·556
374	q	70 50	949·925	0·745	950·670	951·227	− 0·557	+ 0·945	+ 0·328	− 0·569
375	q	70 41	944·923	0·863	945·786	945·772	+ 0·014	+ 0·944	+ 0·331	− 0·582
376	q	50 16	565·481	0·978	566·459	566·574	− 0·115	+ 0·769	+ 0·639	+ 0·969
377	q	50 5	563·864	0·904	564·768	564·717	+ 0·051	+ 0·767	+ 0·642	+ 0·961
378	q	49 51	561·544	0·824	562·368	562·484	− 0·116	+ 0·764	+ 0·645	+ 0·952
379	q	49 34	558·048	0·743	559·691	559·777	− 0·086	+ 0·761	+ 0·649	+ 0·940
380	q	49 16	556·217	0·670	556·887	556·884	+ 0·003	+ 0·758	+ 0·653	+ 0·927
381	q	48 56	554·258	0·618	554·876	554·488	+ 0·388	+ 0·754	+ 0·657	+ 0·916
382	q	48 34	549·938	0·543	550·481	550·369	+ 0·112	+ 0·750	+ 0·662	+ 0·895
383	q	48 19	548·066	0·506	548·572	548·117	+ 0·455	+ 0·747	+ 0·665	+ 0·882
400	q	22 13	417·968	0·147	418·115	417·836	+ 0·279	+ 0·378	+ 0·926	+ 0·217
401	q	21 49	416·944	0·152	417·096	416·951	+ 0·145	+ 0·372	+ 0·928	+ 0·221
402	q	21 19	415·776	0·157	415·933	415·897	+ 0·036	+ 0·364	+ 0·932	+ 0·227
403	q	20 56	415·179	0·162	415·341	415·113	+ 0·228	+ 0·357	+ 0·934	+ 0·232
413	q	321 6	552·854	0·157	553·011	552·459	+ 0·552	− 0·628	+ 0·778	+ 0·029
414	q	320 51	555·145	0·157	555·302	554·663	+ 0·639	− 0·631	+ 0·775	+ 0·036
415	q	320 36	557·100	0·158	557·258	556·986	+ 0·272	− 0·635	+ 0·773	+ 0·042
416	q	320 24	559·613	0·160	559·773	558·799	+ 0·974	− 0·637	+ 0·771	+ 0·047
419	q	308 25	715·532	0·699	716·231	715·703	+ 0·528	− 0·784	+ 0·621	+ 0·896
420	q	308 14	718·275	0·763	719·038	719·089	− 0·051	− 0·786	+ 0·619	+ 0·912
421	q	308 1	722·285	0·854	723·139	723·006	+ 0·133	− 0·788	+ 0·616	+ 0·927
422	q	307 43	727·346	1·020	728·366	728·716	− 0·350	− 0·791	+ 0·612	+ 0·949

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
IX₁	424	r	July 23.....	G	·29358	294° 33′ 54″·19	− 4° 39′ 23″·64	+7″·813	+5″·531	+31″·50	+ 7″·94
	425	n			·30169	33 48·25	39 23·30	+7·591	+5·500	+31·63	+ 7·73
	426	n			·31015	33 42·06	39 22·96	+7·338	+5·467	+31·63	+ 7·73
	427	r			·32887	33 28·35	39 22·19	+6·705	+5·400	+31·50	+ 7·94
	428	r	(1)		·34107	33 19·43	39 21·69	+6·245	+5·359	+31·50	+ 7·94
	429	n			·35572	33 8·72	39 21·09	+5·639	+5·314	+31·63	+ 7·74
	430	n			·36587	33 1·30	39 20·68	+5·195	+5·285	+31·63	+ 7·74
	431	r			·37268	32 56·32	39 20·40	+4·880	+5·269	+31·50	+ 7·95
IX₂	440	q	July 23.....	A	·60243	294 30 8·61	− 4 39 11·57	−6·708	+5·400	+31·59	+ 7·90
	441	q			·60640	30 5·72	39 11·42	−6·850	+5·414	+31·59	+ 7·90
	442	p			·61165	30 1·89	39 11·23	−7·032	+5·432	+31·56	+ 7·83
	443	p			·61542	29 59·14	39 11·09	−7·157	+5·447	+31·56	+ 7·83
	446	p	(2)		·62778	29 50·13	39 10·64	−7·538	+5·493	+31·56	+ 7·83
	447	p			·63244	29 46·73	39 10·47	−7·669	+5·511	+31·56	+ 7·83
	450	q			·64348	29 38·69	39 10·08	−7·955	+5·555	+31·59	+ 7·91
	451	q			·64778	29 35·56	39 9·92	−8·057	+5·573	+31·59	+ 7·91
IX₃	452	r	July 24.....	A	·30126	294 21 41·87	− 4 38 49·68	+7·497	+5·484	+31·60	+ 8·03
	453	r			·30495	21 39·21	38 49·59	+7·387	+5·469	+31·60	+ 8·03
	454	n			·34421	21 10·91	38 48·58	+5·979	+5·335	+31·73	+ 7·82
	455	n			·34708	21 8·84	38 48·51	+5·861	+5·326	+31·73	+ 7·82
	456	n	(2)		·35108	21 5·95	38 48·41	+5·692	+5·314	+31·73	+ 7·82
	457	n			·35439	21 3·57	38 48·33	+5·549	+5·303	+31·73	+ 7·82
	458	r			·36161	20 58·36	38 48·15	+5·232	+5·284	+31·60	+ 8·03
	459	r			·36420	20 56·49	38 48·08	+5·113	+5·277	+31·60	+ 8·03
IX₄	464	p	July 24.....	G	·61892	294 17 53·33	− 4 38 42·21	−7·361	+5·465	+31·65	+ 7·93
	465	q			·62780	17 46·96	38 42·03	−7·622	+5·500	+31·69	+ 8·00
	466	q	(3)		·63736	17 40·09	38 41·83	−7·875	+5·536	+31·69	+ 8·00
	467	p			·64936	17 31·49	38 41·57	−8·152	+5·586	+31·65	+ 7·93
X₁	477	p	July 25.....	G	·34432	294 9 15·92	− 4 38 30·93	+5·830	+5·319	+31·71	+ 7·99
	478	p			·35276	9 9·94	38 30·85	+5·470	+5·294	+31·71	+ 7·99
	479	p	(2)		·36329	9 2·47	38 30·75	+5·000	+5·265	+31·71	+ 7·99
	480	p			·37061	8 57·29	38 30·67	+4·659	+5·247	+31·71	+ 7·99
X₂	482	p	July 25.....	A	·56709	294 6 38·35	− 4 38 29·07	−5·548	+5·297	+31·72	+ 8·01
	483	p			·57049	6 35·95	38 29·05	−5·693	+5·307	+31·72	+ 8·01
	484	p			·57415	6 33·37	38 29·02	−5·847	+5·319	+31·72	+ 8·01
	485	p			·57778	6 30·81	38 29·00	−5·995	+5·329	+31·72	+ 8·01
	490	p	(3)		·59707	6 17·20	38 28·89	−6·735	+5·390	+31·73	+ 8·02
	491	p			·60135	6 14·18	38 28·86	−6·885	+5·404	+31·73	+ 8·02
	492	p			·60583	6 11·02	38 28·83	−7·038	+5·420	+31·73	+ 8·02
	493	p			·60950	6 8·44	38 28·81	−7·158	+5·434	+31·73	+ 8·02

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
424	r	223° 32′	3587″·439	5″·350	3592″·789	3593″·552	− 0″·763	− 0·689	− 0·725	− 0·938
425	n	42 0	5056·270	5·904	5062·174	5061·910	+ 0·264	+ 0·669	+ 0·743	+ 0·915
426	n	41 57	5053·045	5·116	5058·161	5057·850	+ 0·311	+ 0·668	+ 0·744	+ 0·896
427	r	223 51	3606·920	2·992	3609·912	3611·155	− 1·243	− 0·693	− 0·721	− 0·852
428	r	223 58	3614·097	2·584	3616·681	3617·309	− 0·628	− 0·694	− 0·720	− 0·818
429	n	41 38	5032·999	2·942	5035·941	5035·865	+ 0·076	+ 0·664	+ 0·747	+ 0·770
430	n	41 34	5028·739	2·693	5031·432	5030·962	+ 0·470	+ 0·664	+ 0·748	+ 0·739
431	r	224 15	3631·202	1·917	3633·119	3633·445	− 0·326	− 0·698	− 0·716	− 0·717
440	q	290 53	1369·681	1·045	1370·726	1370·220	+ 0·506	− 0·934	+ 0·356	+ 0·817
441	q	290 50	1372·525	1·109	1373·634	1373·099	+ 0·535	− 0·935	+ 0·356	+ 0·831
442	p	101 56	1855·590	1·523	1857·113	1857·514	− 0·401	+ 0·978	− 0·207	− 0·797
443	p	101 57	1852·760	1·614	1854·374	1854·672	− 0·298	+ 0·978	− 0·207	− 0·811
446	p	102 0	1843·162	1·990	1845·152	1845·414	− 0·262	+ 0·978	− 0·208	− 0·849
447	p	102 1	1839·662	2·173	1841·835	1841·934	− 0·099	+ 0·978	− 0·208	− 0·863
450	q	290 29	1398·029	2·200	1400·229	1399·862	+ 0·367	− 0·937	+ 0·350	+ 0·937
451	q	290 27	1401·149	2·438	1403·587	1402·938	+ 0·649	− 0·937	+ 0·349	+ 0·947
452	r	231 16	4104·798	5·099	4109·897	4109·636	+ 0·261	− 0·780	− 0·626	− 0·926
453	r	231 17	4106·853	4·774	4111·627	4111·743	− 0·116	− 0·780	− 0·625	− 0·917
454	n	34 44	4616·813	2·873	4619·686	4618·900	+ 0·786	+ 0·570	+ 0·822	+ 0·779
455	n	34 42	4616·175	2·797	4618·972	4617·707	+ 1·265	+ 0·569	+ 0·822	+ 0·770
456	n	34 40	4613·915	2·697	4616·612	4616·039	+ 0·573	+ 0·569	+ 0·822	+ 0·759
457	n	34 39	4612·940	2·621	4615·561	4614·670	+ 0·891	+ 0·569	+ 0·823	+ 0·751
458	r	231 40	4142·029	2·331	4144·360	4144·519	− 0·159	− 0·784	− 0·620	− 0·736
459	r	231 41	4143·412	2·276	4145·688	4146·033	− 0·345	− 0·785	− 0·620	− 0·727
464	p	108 3	1145·822	1·198	1147·020	1147·118	− 0·098	+ 0·951	− 0·310	− 0·867
465	q	284 23	2083·307	2·407	2085·714	2085·722	− 0·008	− 0·969	+ 0·248	+ 0·872
466	q	284 20	2089·555	2·931	2092·486	2092·665	− 0·179	− 0·969	+ 0·248	+ 0·899
467	p	108 22	1122·439	2·253	1124·692	1125·453	− 0·761	+ 0·949	− 0·315	− 0·947
477	p	120 21	680·646	0·213	680·859	681·395	− 0·536	+ 0·863	− 0·505	+ 0·233
478	p	120 37	675·504	0·205	675·709	675·923	− 0·214	+ 0·861	− 0·509	+ 0·200
479	p	120 57	668·156	0·193	668·349	669·083	− 0·734	+ 0·858	− 0·514	+ 0·157
480	p	121 11	663·189	0·192	663·381	664·339	− 0·958	+ 0·856	− 0·518	+ 0·126
482	p	129 13	541·195	0·324	541·519	541·608	− 0·089	+ 0·775	− 0·632	− 0·764
483	p	129 23	538·695	0·334	539·029	539·630	− 0·601	+ 0·773	− 0·635	− 0·776
484	p	129 34	536·382	0·346	536·728	537·496	− 0·768	+ 0·771	− 0·637	− 0·789
485	p	129 45	534·507	0·359	534·866	535·397	− 0·531	+ 0·769	− 0·639	− 0·801
490	p	130 44	522·950	0·444	523·394	524·375	− 0·981	+ 0·750	− 0·662	− 0·851
491	p	130 57	520·891	0·469	521·360	521·958	− 0·598	+ 0·755	− 0·655	− 0·872
492	p	131 11	517·623	0·497	518·120	519·438	− 1·318	+ 0·753	− 0·658	− 0·886
493	p	131 23	515·739	0·526	516·265	517·394	− 1·129	+ 0·750	− 0·661	− 0·895

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
X_3	498	p	July 26.....	A	·29433	293° 58′ 8″·60	− 4° 38′ 28″·21	+7″·484	+5″·469	+31″·78	+ 8″·08
	499	p			·29803	58 6·03	38 28·22	+7·376	+5·454	+31·78	+ 8·08
	501	p	(3)		·31514	57 54·12	38 28·29	+6·818	+5·392	+31·78	+ 8·08
	502	p			·31874	57 51·62	38 28·31	+6·688	+5·380	+31·78	+ 8·08
	503	p			·32215	57 49·25	38 28·33	+6·565	+5·368	+31·78	+ 8·08
	504	p			·32573	57 46·76	38 28·34	+6·428	+5·357	+31·78	+ 8·08
X_4	505	p	July 26.....	G	·56512	293 55 0·71	− 4 38 29·90	−5·591	+5·292	+31·80	+ 8·10
	506	p			·57284	54 55·37	38 29·96	−5·915	+5·314	+31·80	+ 8·10
	507	p	(3)		·58324	54 48·18	38 30·06	−6·325	+5·346	+31·80	+ 8·10
	508	p			·59116	54 42·70	38 30·13	−6·627	+5·372	+31·80	+ 8·10
X_5	511	p	July 27.....	G	·29043	293 46 42·81	− 4 38 39·80	+7·489	+5·460	+31·85	+ 8·16
	512	p			·29629	46 38·82	38 39·91	+7·316	+5·439	+31·85	+ 8·16
	513	p	(1)		·30799	46 30·85	38 40·13	+6·940	+5·396	+31·85	+ 8·16
	514	p			·31448	46 26·43	38 40·25	+6·710	+5·373	+31·85	+ 8·16
X_6	528	p	July 27.....	A	·58869	293 43 20·44	− 4 38 46·11	−6·640	+5·363	+31·87	+ 8·19
	529	p			·59371	43 17·05	38 46·22	−6·820	+5·380	+31·87	+ 8·19
	530	p	(3)		·59924	43 13·31	38 46·36	−7·008	+5·399	+31·87	+ 8·19
	531	p			·60412	43 10·01	38 46·47	−7·166	+5·417	+31·87	+ 8·19
XI_1	532	p	July 28	A	·28600	293 35 32·93	− 4 39 5·89	+7·509	+5·454	+31·91	+ 8·25
	533	p			·28902	35 30·93	39 5·99	+7·420	+5·440	+31·91	+ 8·25
	534	m			·29344	35 27·99	39 6·13	+7·287	+5·424	+31·89	+ 8·13
	535	m	(1)		·29596	35 26·32	39 6·22	+7·210	+5·414	+31·89	+ 8·13
	536	m			·30154	35 22·61	39 6·41	+7·031	+5·395	+31·89	+ 8·13
	537	m			·30491	35 20·43	39 6·52	+6·920	+5·383	+31·89	+ 8·13
	538	p			·30916	35 17·55	39 6·67	+6·768	+5·368	+31·92	+ 8·25
	539	p			·31149	35 16·01	39 6·75	+6·687	+5·360	+31·92	+ 8·25
XI_2	552	m	July 28	G	·59274	293 32 9·92	− 4 39 16·80	−6·886	+5·376	+31·90	+ 8·15
	553	p			·60252	32 3·47	39 17·17	−7·205	+5·410	+31·94	+ 8·28
	554	p	(3)		·61788	31 53·35	39 17·76	−7·653	+5·469	+31·94	+ 8·28
	555	m			·62644	31 47·71	39 18·08	−7·869	+5·502	+31·90	+ 8·15
XI_3	558	o	July 29	G	·27830	293 24 42·10	− 4 39 45·97	+7·616	+5·457	+31·92	+ 8·33
	559	o			·28194	24 39·75	39 46·15	+7·515	+5·442	+31·92	+ 8·33
	560	m			·29043	24 34·25	39 46·55	+7·263	+5·410	+31·93	+ 8·21
	561	m	(2)		·29898	24 28·72	39 46·96	+6·992	+5·379	+31·93	+ 8·21
	562	m			·30890	24 22·30	39 47·43	+6·648	+5·344	+31·93	+ 8·21
	563	m			·31480	24 18·49	39 47·72	+6·435	+5·325	+31·93	+ 8·21
	564	o			·32158	24 14·11	39 48·04	+6·176	+5·301	+31·92	+ 8·33
	565	o			·32588	24 11·33	39 48·25	+6·007	+5·289	+31·92	+ 8·33

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
498	p	192° 29′	348″·436	0″·283	348″·719	349″·719	— 1″·000	— 0·216	— 0·976	— 0·695
499	p	192 54	349·209	0·273	349·482	350·333	— 0·851	— 0·223	— 0·975	— 0·695
501	p	194 52	352·188	0·234	352·422	353·443	— 1·021	— 0·257	— 0·967	— 0·696
502	p	195 16	352·802	0·229	353·031	354·152	— 1·121	— 0·263	— 0·965	— 0·694
503	p	195 39	353·489	0·223	353·712	354·843	— 1·131	— 0·270	— 0·963	— 0·693
504	p	196 4	354·404	0·217	354·621	355·579	— 0·958	— 0·277	— 0·961	— 0·692
505	p	218 47	439·600	0·126	439·726	440·460	— 0·734	— 0·626	— 0·780	— 0·064
506	p	219 21	442·940	0·126	443·066	444·047	— 0·981	— 0·634	— 0·773	— 0·036
507	p	220 5	447·643	0·127	447·770	448·940	— 1·170	— 0·644	— 0·765	— 0·003
508	p	220 39	451·898	0·128	452·026	452·710	— 0·684	— 0·651	— 0·759	+ 0·022
511	p	245 3	835·515	1·010	836·525	837·315	— 0·790	— 0·907	— 0·422	— 0·907
512	p	245 10	839·594	0·913	840·507	841·132	— 0·625	— 0·908	— 0·420	— 0·890
513	p	245 23	847·519	0·761	848·280	848·801	— 0·521	— 0·909	— 0·417	— 0·854
514	p	245 30	851·666	0·698	852·364	853·079	— 0·715	— 0·910	— 0·415	— 0·832
528	p	249 45	1038·456	0·439	1038·895	1039·218	— 0·323	— 0·938	— 0·346	+ 0·436
529	p	249 49	1041·842	0·462	1042·304	1042·589	— 0·285	— 0·939	— 0·345	+ 0·452
530	p	249 53	1045·351	0·492	1045·843	1046·307	— 0·464	— 0·939	— 0·344	+ 0·470
531	p	249 57	1048·506	0·523	1049·029	1049·578	— 0·549	— 0·939	— 0·343	+ 0·485
532	p	255 7	1474·658	1·671	1476·329	1476·522	— 0·193	— 0·967	— 0·257	— 0·864
533	p	255 8	1476·880	1·581	1478·461	1478·564	— 0·103	— 0·967	— 0·257	— 0·855
534	m	68 16	2350·589	2·393	2352·982	2353·029	— 0·047	+ 0·929	+ 0·370	+ 0·876
535	m	68 15	2349·221	2·293	2351·514	2351·370	+ 0·144	+ 0·929	+ 0·371	+ 0·869
536	m	68 13	2346·341	2·094	2348·435	2347·697	+ 0·738	+ 0·929	+ 0·371	+ 0·851
537	m	68 12	2343·795	1·989	2345·784	2345·530	+ 0·254	+ 0·929	+ 0·371	+ 0·841
538	p	255 14	1490·703	1·148	1491·851	1492·276	— 0·425	— 0·967	— 0·255	— 0·790
539	p	255 15	1492·317	1·112	1493·429	1493·860	— 0·431	— 0·967	— 0·255	— 0·782
552	m	66 27	2152·819	0·912	2153·731	2153·645	+ 0·086	+ 0·917	+ 0·400	— 0·415
553	p	256 41	1694·097	0·998	1695·095	1696·045	— 0·950	— 0·973	— 0·230	+ 0·575
554	p	256 45	1705·087	1·278	1706·365	1706·412	— 0·047	— 0·973	— 0·229	+ 0·617
555	m	66 14	2130·326	1·366	2131·692	2132·012	— 0·320	+ 0·915	+ 0·403	— 0·496
558	o	220 16	1762·848	2·284	1765·132	1766·075	— 0·943	— 0·646	— 0·763	— 0·908
559	o	220 19	1764·411	2·138	1766·549	1767·807	— 1·258	— 0·647	— 0·763	— 0·900
560	m	61 34	1743·224	1·808	1745·032	1744·698	+ 0·334	+ 0·879	+ 0·476	+ 0·894
561	m	61 29	1738·563	1·574	1740·137	1739·408	+ 0·729	+ 0·879	+ 0·478	+ 0·870
562	m	61 24	1732·183	1·359	1733·542	1733·245	+ 0·297	+ 0·878	+ 0·479	+ 0·838
563	m	61 21	1728·669	1·256	1729·925	1729·587	+ 0·338	+ 0·878	+ 0·479	+ 0·818
564	o	220 56	1784·636	1·239	1785·875	1786·860	— 0·985	— 0·655	— 0·756	— 0·805
565	o	221 0	1786·866	1·183	1788·049	1788·955	— 0·906	— 0·656	— 0·755	— 0·792

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XI_4	566	m	July 31.....	A	·54690	293 1 4·22	− 4 42 8·41	−5·438	+5·215	+32·03	+ 8·39
	567	m	(2)		·55130	1 1·57	42 8·75	−5·622	+5·228	+32·03	+ 8·39
	572	m			·57667	0 46·31	42 10·73	−6·609	+5·307	+32·03	+ 8·39
	573	m			·58182	0 43·21	42 11·13	−6·790	+5·324	+32·03	+ 8·39
XI_5	584	k	Aug. 1	A	·30684	292 53 33·02	− 4 43 11·36	+6·317	+5·267	+32·00	+ 8·45
	585	m	(1)		·31060	53 30·82	43 11·69	+6·178	+5·256	+32·05	+ 8·44
	586	m			·31336	53 29·21	43 11·94	+6·070	+5·246	+32·05	+ 8·44
	587	k			·31714	53 27·00	43 12·27	+5·920	+5·236	+32·00	+ 8·45
XI_6	592	k	Aug. 1	G	·54682	292 51 13·16	− 4 43 32·79	−5·555	+5·204	+32·00	+ 8·47
	593	k	(1)		·55243	51 9·91	43 33·30	−5·785	+5·221	+32·00	+ 8·47
	594	m			·56014	51 5·44	43 34·00	−6·091	+5·244	+32·06	+ 8·46
	595	m			·56412	51 3·13	43 34·36	−6·244	+5·257	+32·06	+ 8·46
	596	m			·56837	51 0·66	43 34·75	−6·402	+5·269	+32·06	+ 8·46
	597	m			·57347	50 57·71	43 35·21	−6·586	+5·287	+32·06	+ 8·46
	598	k			·58101	50 53·34	43 35·90	−6·849	+5·314	+32·00	+ 8·47
	599	k			·58563	50 50·67	43 36·32	−6·997	+5·331	+32·00	+ 8·47
XI_7	604	k	Aug. 2	G	·34605	292 43 36·78	− 4 44 49·43	+4·514	+5·128	+32·02	+ 8·53
	605	i	(1)		·35219	43 33·33	44 50·05	+4·225	+5·113	+32·07	+ 8·48
	606	i			·35533	43 31·57	44 50·36	+4·077	+5·106	+32·07	+ 8·48
	607	k			·35947	43 29·24	44 50·78	+3·875	+5·097	+32·02	+ 8·53
XII_1	619	g	Aug. 5	A	·31219	292 17 37·56	− 4 50 40·79	+5·532	+5·127	+32·00	+ 8·67
	620	g	(2)		·31943	17 34·02	50 41·76	+5·231	+5·103	+32·00	+ 8·67
	621	g			·35016	17 19·03	50 45·94	+4·160	+5·043	+32·00	+ 8·67
	622	g			·35592	17 16·23	50 46·72	+3·553	+5·016	+32·00	+ 8·67
	623	g			·36307	17 12·75	50 47·69	+3·198	+5·003	+32·00	+ 8·67
	624	g			·36879	17 9·96	50 48·47	+2·909	+4·995	+32·00	+ 8·67
XII_2	625	f	Aug. 6	G	·26470	292 10 4·61	− 4 52 54·69	+7·093	+5·253	+32·01	+ 8·67
	626	f	(1)		·27013	10 2·09	52 55·48	+6·926	+5·231	+32·01	+ 8·67
	627	f			·27495	9 59·86	52 56·19	+6·774	+5·214	+32·01	+ 8·67
	628	f			·28027	9 57·40	52 56·96	+6·597	+5·194	+32·01	+ 8·67
	629	f			·28536	9 55·04	52 57·71	+6·418	+5·177	+32·01	+ 8·67
	630	f			·28933	9 53·21	52 58·29	+6·278	+5·163	+32·01	+ 8·67
	631	f			·29292	9 51·55	52 58·81	+6·144	+5·151	+32·01	+ 8·67
	632	f			·29610	9 50·08	52 59·27	+6·025	+5·141	+32·01	+ 8·67

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
566	m	9 36	698·495	0·263	698·758	698·236	+ 0·522	+ 0·167	+ 0·986	+ 0·424
567	m	9 22	698·228	0·267	698·495	697·446	+ 1·049	+ 0·163	+ 0·987	+ 0·425
572	m	8 4	693·645	0·296	693·941	693·111	+ 0·830	+ 0·140	+ 0·990	+ 0·434
573	m	7 49	692·759	0·301	693·060	692·273	+ 0·787	+ 0·136	+ 0·991	+ 0·435
584	k	137 11	859·115	0·248	859·363	860·378	— 1·015	+ 0·680	— 0·734	+ 0·041
585	m	332 37	704·544	0·220	704·764	704·089	+ 0·675	— 0·460	+ 0·888	+ 0·183
586	m	332 29	705·100	0·220	705·320	704·648	+ 0·672	— 0·462	+ 0·887	+ 0·186
587	k	137 32	855·200	0·246	855·446	856·735	— 1·289	+ 0·675	— 0·738	+ 0·011
592	k	146 24	782·063	0·479	782·542	783·498	— 0·956	+ 0·553	— 0·833	— 0·739
593	k	146 38	780·192	0·502	780·694	781·993	— 1·299	+ 0·550	— 0·835	— 0·753
594	m	321 25	771·693	0·544	772·237	771·197	+ 1·040	— 0·624	+ 0·782	+ 0·789
595	m	321 15	772·620	0·569	773·189	772·463	+ 0·726	— 0·626	+ 0·780	+ 0·800
596	m	321 5	773·978	0·599	774·577	773·810	+ 0·767	— 0·628	+ 0·778	+ 0·811
597	m	320 53	775·624	0·640	776·264	775·438	+ 0·826	— 0·631	+ 0·776	+ 0·826
598	k	147 50	772·787	0·678	773·465	774·592	— 1·127	+ 0·532	— 0·847	— 0·813
599	k	148 1	772·043	0·720	772·763	773·438	— 0·675	+ 0·530	— 0·848	— 0·822
604	k	180 54	728·276	0·300	728·576	729·499	— 0·923	— 0·016	— 1·000	— 0·520
605	i	9 50	983·981	0·425	984·406	983·451	+ 0·955	+ 0·171	+ 0·985	+ 0·575
606	i	9 43	983·444	0·419	983·863	982·823	+ 1·040	+ 0·169	+ 0·986	+ 0·573
607	k	181 32	729·655	0·293	729·948	731·050	— 1·102	— 0·027	— 1·000	— 0·520
619	g	140 20	727·646	0·210	727·856	728·846	— 0·990	+ 0·638	— 0·770	— 0·044
620	g	140 37	726·281	0·210	726·491	727·173	— 0·682	+ 0·635	— 0·773	— 0·063
621	g	141 49	718·885	0·215	719·100	720·452	— 1·352	+ 0·618	— 0·786	— 0·140
622	g	142 4	718·350	0·216	718·566	718·995	— 0·429	+ 0·615	— 0·789	— 0·179
623	g	142 21	716·244	0·219	716·463	717·438	— 0·975	+ 0·611	— 0·792	— 0·202
624	g	142 35	715·138	0·220	715·358	716·179	— 0·821	+ 0·608	— 0·794	— 0·221
625	f	64 0	799·165	0·859	800·024	800·551	— 0·527	+ 0·899	+ 0·438	+ 0·865
626	f	63 58	796·836	0·785	797·621	797·796	— 0·175	+ 0·899	+ 0·439	+ 0·851
627	f	63 57	794·902	0·724	795·626	795·336	+ 0·290	+ 0·898	+ 0·439	+ 0·835
628	f	63 55	792·039	0·668	792·707	792·635	+ 0·072	+ 0·898	+ 0·440	+ 0·819
629	f	63 53	789·386	0·620	790·006	790·028	— 0·022	+ 0·898	+ 0·440	+ 0·803
630	f	63 52	787·590	0·588	788·178	788·002	+ 0·176	+ 0·898	+ 0·440	+ 0·789
631	f	63 50	785·653	0·559	786·212	786·158	+ 0·054	+ 0·897	+ 0·441	+ 0·776
632	f	63 49	784·049	0·537	784·586	784·538	+ 0·048	+ 0·897	+ 0·441	+ 0·765

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
XII$_3$	651	f	Aug. 6	A	·57092	292° 7′ 44″·10	− 4° 53′ 39″·80	−6″·902	+5″·222	+32″·01	+ 8″·69
	652	f			·57493	7 42·28	53 40·39	−7·026	+5·237	+32·01	+ 8·69
	653	f			·57838	7 40·71	53 40·91	−7·130	+5·249	+32·01	+ 8·69
	654	f	(2)		·58172	7 39·20	53 41·41	−7·226	+5·262	+32·01	+ 8·69
	655	f			·58567	7 37·40	53 41·99	−7·334	+5·278	+32·01	+ 8·69
	656	f			·58861	7 36·07	53 42·43	−7·414	+5·289	+32·01	+ 8·69
	657	f			·59163	7 34·70	53 42·88	−7·491	+5·301	+32·01	+ 8·69
	658	f			·59430	7 33·48	53 43·28	−7·559	+5·311	+32·01	+ 8·69
XII$_4$	659	f	Aug. 7	A	·25234	292 2 40·71	− 4 55 23·64	+7·326	+5·262	+32·00	+ 8·74
	660	f			·25514	2 39·49	55 24·07	+7·249	+5·251	+32·00	+ 8·74
	661	f			·25789	2 38·29	55 24·50	+7·171	+5·240	+32·00	+ 8·74
	662	f	(2)		·26039	2 37·20	55 24·89	+7·099	+5·231	+32·00	+ 8·74
	663	f			·26414	2 35·56	55 25·48	+6·986	+5·215	+32·00	+ 8·74
	664	f			·26695	2 34·34	55 25·91	+6·901	+5·205	+32·00	+ 8·74
	665	f			·27022	2 32·92	55 26·42	+6·797	+5·193	+32·00	+ 8·74
	666	f			·27265	2 31·86	55 26·80	+6·719	+5·184	+32·00	+ 8·74
XII$_5$	673	f	Aug. 7	G	·52548	292 0 42·67	− 4 56 6·57	−5·322	+5·055	+31·99	+ 8·76
	674	f			·53163	0 40·04	56 7·55	−5·574	+5·074	+31·99	+ 8·76
	675	f	(1)		·53808	0 37·28	56 8·58	−5·829	+5·095	+31·99	+ 8·76
	676	f			·54508	0 34·29	56 9·69	−6·093	+5·115	+31·99	+ 8·76
XII$_6$	689	f	Aug. 8	G	·27257	291 55 30·48	− 4 58 7·83	+6·592	+5·147	+31·97	+ 8·80
	690	f	(2)		·27881	55 27·94	58 8·87	+6·377	+5·124	+31·97	+ 8·80
XII$_7$	709	f	Aug. 8	A	·59818	291 53 19·31	− 4 59 2·37	−7·721	+5·301	+31·96	+ 8·83
	710	f			·60114	53 18·13	59 2·87	−7·783	+5·312	+31·96	+ 8·83
	711	f			·60422	53 16·90	59 3·39	−7·843	+5·327	+31·96	+ 8·83
	712	f	(2)		·60725	53 15·70	59 3·91	−7·903	+5·340	+31·96	+ 8·83
	713	f			·60975	53 14·70	59 4·33	−7·948	+5·350	+31·96	+ 8·83
	714	f			·61299	53 13·42	59 4·88	−8·002	+5·364	+31·96	+ 8·83
	715	f			·61939	53 10·88	59 5·96	−8·104	+5·392	+31·96	+ 8·83
	716	f			·62210	53 9·80	59 6·42	−8·144	+5·403	+31·96	+ 8·83
XII$_8$	718	f	Aug. 9	A	·25799	291 49 2·86	− 5 0 55·95	+6·925	+5·161	+31·95	+ 8·87
	719	f			·26022	49 2·02	0 56·34	+6·861	+5·155	+31·95	+ 8·87
	720	f			·26250	49 1·15	0 56·74	+6·790	+5·145	+31·95	+ 8·87
	721	f			·26454	49 0·38	0 57·09	+6·728	+5·137	+31·95	+ 8·87
	722	f	(3)		·26858	48 58·85	0 57·80	+6·598	+5·121	+31·95	+ 8·87
	723	f	*		·27256	48 57·34	0 58·50	+6·463	+5·107	+31·95	+ 8·87
	724	f			·27541	48 56·26	0 58·99	+6·363	+5·098	+31·95	+ 8·87
	725	f			·27860	48 55·05	0 59·55	+6·253	+5·085	+31·95	+ 8·87

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
651	f	61° 37′	642″·523	0″·267	642″·790	642″·958	— 0″·168	+ 0·880	+ 0·475	— 0·357
652	f	61 34	640·522	0·274	640·796	640·978	— 0·182	+ 0·879	+ 0·476	— 0·367
653	f	61 33	638·876	0·282	639·158	639·272	— 0·114	+ 0·879	+ 0·476	— 0·374
654	f	61 31	636·964	0·291	637·255	637·629	— 0·374	+ 0·879	+ 0·477	— 0·382
655	f	61 29	635·562	0·303	635·865	635·698	+ 0·167	+ 0·879	+ 0·478	— 0·390
656	f	61 27	634·208	0·314	634·522	634·258	+ 0·264	+ 0·878	+ 0·478	— 0·395
657	f	61 25	632·411	0·327	632·738	632·779	— 0·041	+ 0·878	+ 0·478	— 0·402
658	f	61 24	630·986	0·337	631·323	331·464	— 0·141	+ 0·878	+ 0·479	— 0·407
659	f	53 58	342·723	0·444	343·167	343·188	— 0·021	+ 0·809	+ 0·588	+ 0·900
660	f	53 54	341·321	0·419	341·740	341·882	— 0·142	+ 0·808	+ 0·589	+ 0·893
661	f	53 50	340·500	0·397	340·897	340·593	+ 0·304	+ 0·807	+ 0·590	+ 0·885
662	f	53 47	339·127	0·379	339·506	339·424	+ 0·082	+ 0·807	+ 0·591	+ 0·880
663	f	53 41	337·193	0·354	337·547	337·663	— 0·116	+ 0·806	+ 0·592	+ 0·870
664	f	53 37	336·095	0·338	336·433	336·351	+ 0·082	+ 0·805	+ 0·593	+ 0·862
665	f	53 32	334·544	0·321	334·865	334·818	+ 0·047	+ 0·804	+ 0·594	+ 0·853
666	f	53 28	333·267	0·307	333·574	333·673	— 0·099	+ 0·804	+ 0·595	+ 0·846
673	f	42 53	216·777	0·061	216·838	216·564	+ 0·274	+ 0·681	+ 0·733	+ 0·010
674	f	42 30	213·991	0·060	214·051	213·905	+ 0·146	+ 0·676	+ 0·737	— 0·001
675	f	42 4	210·937	0·060	210·997	211·141	— 0·144	+ 0·670	+ 0·742	— 0·011
676	f	41 37	208·393	0·059	208·452	208·169	+ 0·283	+ 0·664	+ 0·748	— 0·020
689	f	283 52	156·754	0·077	156·831	156·338	+ 0·493	— 0·971	+ 0·240	— 0·513
690	f	283 16	159·310	0·076	159·386	158·750	+ 0·636	— 0·973	+ 0·230	— 0·500
709	f	266 44	297·094	0·383	297·477	297·178	+ 0·299	— 0·998	— 0·057	+ 0·737
710	f	266 39	298·324	0·412	298·736	298·440	+ 0·296	— 0·998	— 0·058	+ 0·744
711	f	266 34	299·720	0·445	300·165	299·752	+ 0·413	— 0·998	— 0·060	+ 0·747
712	f	266 29	300·935	0·486	301·421	301·036	+ 0·385	— 0·998	— 0·061	+ 0·752
713	f	266 25	301·806	0·521	302·327	302·105	+ 0·222	— 0·998	— 0·063	+ 0·757
714	f	266 20	303·396	0·572	303·968	303·462	+ 0·506	— 0·998	— 0·064	+ 0·761
715	f	266 10	306·121	0·706	306·827	306·155	+ 0·672	— 0·998	— 0·067	+ 0·769
716	f	266 6	307·097	0·776	307·873	307·298	+ 0·575	— 0·998	— 0·068	+ 0·772
718	f	256 20	552·913	0·508	553·421	553·218	+ 0·203	— 0·972	— 0·236	— 0·793
719	f	256 19	553·950	0·494	554·444	554·191	+ 0·253	— 0·972	— 0·237	— 0·786
720	f	256 18	554·935	0·477	555·412	555·198	+ 0·214	— 0·972	— 0·237	— 0·779
721	f	256 17	555·997	0·456	556·453	556·087	+ 0·366	— 0·972	— 0·237	— 0·773
722	f	256 15	557·687	0·431	558·118	557·866	+ 0·252	— 0·971	— 0·238	— 0·760
723	f	256 13	559·482	0·414	559·896	559·632	+ 0·264	— 0·971	— 0·238	— 0·747
724	f	256 12	560·777	0·400	561·177	560·893	+ 0·284	— 0·971	— 0·239	— 0·737
725	f	256 11	562·246	0·382	562·628	562·305	+ 0·323	— 0·971	— 0·239	— 0·726

* XII_8. Rejected. Bad definition, fog and neighbourhood of Moon. Distances observed without screening Star to have one easily visible object in field. These conditions, notwithstanding the very exact agreement of the observations *inter se*, probably have produced systematic difference in habit of observing.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax. α	Parallax. δ	Star Correction. α	Star Correction. δ
						° ′ ″	° ′ ″	″	″	″	″
XIII$_1$	737	f	Aug. 10.....	G	·26216	291 42 56·71	− 5 3 56·43	+6·677	+5·105	+31·91	+ 8·94
	738	f			·26752	42 54·83	3 57·41	+6·501	+5·087	+31·91	+ 8·94
	739	e			·27855	42 50·97	3 59·44	+6·118	+5·048	+31·89	+ 8·82
	740	e			·28291	42 49·45	4 0·24	+5·960	+5·032	+31·89	+ 8·82
	741	e	(2)		·28758	42 47·82	4 1·11	+5·782	+5·014	+31·89	+ 8·82
	742	e			·29189	42 46·32	4 1·90	+5·615	+5·003	+31·89	+ 8·82
	743	f			·29752	42 44·35	4 2·95	+5·392	+4·986	+31·91	+ 8·94
	744	f			·30119	42 43·07	4 3·62	+5·240	+4·974	+31·91	+ 8·94
XIII$_2$	757	f	Aug. 10.....	A	·53807	291 41 21·27	− 5 4 47·58	−6·088	+5·038	+31·90	+ 8·95
	758	e	(2)		·54262	41 19·71	4 48·43	−6·251	+5·053	+31·88	+ 8·83
	759	e			·54634	41 18·44	4 49·13	−6·378	+5·066	+31·88	+ 8·83
	760	f			·55509	41 15·45	4 50·77	−6·668	+5·097	+31·90	+ 8·95
XIII$_3$	761	f	Aug. 11.....	A	·24308	291 37 27·72	− 5 7 1·24	+7·120	+5·139	+31·87	+ 8·99
	762	f			·24553	37 26·93	7 1·72	+7·049	+5·129	+31·87	+ 8·99
	763	e			·25110	37 25·14	7 2·80	+6·890	+5·107	+31·84	+ 8·87
	764	e			·25591	37 23·60	7 3·73	+6·743	+5·088	+31·84	+ 8·87
	765	e	(2)		·26001	37 22·29	7 4·52	+6·616	+5·072	+31·84	+ 8·87
	766	e			·26398	37 21·02	7 5·29	+6·486	+5·057	+31·84	+ 8·87
	767	f			·26991	37 19·12	7 6·43	+6·286	+5·037	+31·87	+ 8·99
	768	f			·27294	37 18·15	7 7·02	+6·179	+5·025	+31·87	+ 8·99
XIII$_4$	776	e	Aug. 12.....	G	·26215	291 32 16·44	− 5 10 21·74	+6·418	+5·025	+31·79	+ 8·93
	777	e			·26850	32 14·60	10 23·01	+6·200	+5·001	+31·79	+ 8·93
	778	e			·27413	32 12·96	10 24·14	+6·002	+4·981	+31·79	+ 8·93
	779	e	(3)		·27744	32 12·00	10 24·81	+5·881	+4·969	+31·79	+ 8·93
	780	e			·28202	32 10·68	10 25·73	+5·710	+4·955	+31·79	+ 8·93
	781	e			·28700	32 9·23	10 26·73	+5·518	+4·939	+31·79	+ 8·93
	782	e			·29688	32 6·38	10 28·72	+5·121	+4·908	+31·79	+ 8·93
	783	e			·30674	32 3·53	10 30·70	+4·708	+4·882	+31·79	+ 8·93
XIII$_5$	787	e	Aug. 14.....	G	·34251	291 23 19·71	− 5 17 35·74	+2·754	+4·722	+31·67	+ 9·03
	788	e	(1)		·34620	23 18·88	17 36·53	+2·574	+4·718	+31·67	+ 9·03
	791	e			·35631	23 16·60	17 38·72	+2·067	+4·703	+31·67	+ 9·03
	792	e			·35962	23 15·86	17 39·43	+1·904	+4·700	+31·67	+ 9·03
XIII$_6$	793	e	Aug. 16.....	G	·26621	291 17 4·21	− 5 24 43·73	+5·741	+4·836	+31·54	+ 9·13
	794	e	(2)		·26940	17 3·68	24 44·45	+5·625	+4·826	+31·54	+ 9·13
	797	e			·30849	16 57·28	24 53·40	+4·030	+4·713	+31·53	+ 9·13
	798	e			·33844	16 52·40	25 0·25	+2·636	+4·652	+31·53	+ 9·13

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
737	f	250 58	953·655	0·823	954·478	954·671	− 0·193	− 0·945	− 0·326	− 0·795
738	f	250 57	955·801	0·761	956·562	956·937	− 0·375	− 0·945	− 0·326	− 0·778
739	e	45 29	1452·235	1·058	1453·293	1453·577	− 0·284	+ 0·713	+ 0·701	+ 0·789
740	e	45 28	1451·010	1·006	1452·016	1451·808	+ 0·208	+ 0·713	+ 0·701	+ 0·777
741	e	45 26	1449·130	0·955	1450·085	1449·900	+ 0·185	+ 0·712	+ 0·702	+ 0·762
742	e	45 25	1447·456	0·910	1448·366	1448·161	+ 0·205	+ 0·712	+ 0·702	+ 0·749
743	f	250 52	968·898	0·532	969·430	969·691	− 0·261	− 0·945	− 0·328	− 0·671
744	f	250 51	970·686	0·513	971·199	971·263	− 0·064	− 0·945	− 0·328	− 0·656
757	f	250 16	1073·169	0·428	1073·597	1073·341	+ 0·256	− 0·941	− 0·338	+ 0·401
758	e	43 53	1346·038	0·385	1346·423	1346·153	+ 0·270	+ 0·693	+ 0·721	− 0·067
759	e	43 52	1344·701	0·385	1345·086	1344·696	+ 0·390	+ 0·693	+ 0·721	− 0·074
760	f	250 13	1079·877	0·506	1080·383	1080·398	− 0·015	− 0·941	− 0·338	+ 0·453
761	f	248 2	1324·367	1·528	1325·895	1326·003	− 0·108	− 0·927	− 0·374	− 0·849
762	f	248 1	1325·203	1·464	1326·667	1326·980	− 0·313	− 0·927	− 0·374	− 0·843
763	e	40 28	1097·868	1·091	1098·959	1098·436	+ 0·523	+ 0·649	+ 0·761	+ 0·834
764	e	40 25	1095·915	1·013	1096·928	1096·621	+ 0·307	+ 0·648	+ 0·761	+ 0·822
765	e	40 24	1094·717	0·955	1095·672	1095·081	+ 0·591	+ 0·648	+ 0·762	+ 0·813
766	e	40 22	1093·013	0·903	1093·916	1093·583	+ 0·333	+ 0·648	+ 0·762	+ 0·805
767	f	247 58	1335·439	0·005	1336·444	1336·693	− 0·249	− 0·927	− 0·375	− 0·770
768	f	247 58	1337·220	0·966	1338·186	1337·915	+ 0·271	− 0·927	− 0·375	− 0·758
776	e	32 27	754·552	0·581	755·133	754·535	+ 0·598	+ 0·537	+ 0·844	+ 0·767
777	e	32 23	752·042	0·539	752·581	752·346	+ 0·235	+ 0·536	+ 0·845	+ 0·754
778	e	32 18	750·588	0·504	751·092	750·395	+ 0·697	+ 0·534	+ 0·845	+ 0·740
779	e	32 16	749·194	0·486	749·680	749·245	+ 0·435	+ 0·534	+ 0·846	+ 0·733
780	e	32 12	747·589	0·465	748·054	747·667	+ 0·387	+ 0·533	+ 0·846	+ 0·722
781	e	32 9	745·749	0·442	746·191	745·934	+ 0·257	+ 0·532	+ 0·847	+ 0·711
782	e	32 1	742·301	0·405	742·706	742·504	+ 0·202	+ 0·530	+ 0·848	+ 0·686
783	e	31 53	739·280	0·374	739·654	739·080	+ 0·574	+ 0·528	+ 0·849	+ 0·662
787	e	326 40	242·832	0·145	242·977	242·109	+ 0·868	− 0·550	+ 0·836	+ 0·244
788	e	326 22	242·911	0·147	243·058	242·005	+ 1·053	− 0·554	+ 0·832	+ 0·251
791	e	325 31	242·398	0·147	242·545	241·724	+ 0·821	− 0·566	+ 0·824	+ 0·270
792	e	325 15	242·267	0·147	242·414	241·654	+ 0·760	− 0·570	+ 0·821	+ 0·278
793	e	245 52	551·498	0·367	551·865	552·029	− 0·164	− 0·913	− 0·409	− 0·720
794	e	245 50	552·577	0·355	552·932	552·909	+ 0·023	− 0·912	− 0·409	− 0·703
797	e	245 19	563·445	0·250	563·695	563·902	− 0·207	− 0·909	− 0·418	− 0·562
798	e	244 57	572·344	0·208	572·552	572·471	+ 0·081	− 0·906	− 0·423	− 0·435

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XIII$_7$	813	e	Aug. 16.....	A	·55318	291 16 18·29	− 5 25 49·57	−6·911	+4·967	+31·52	+ 9·14
	814	e	(3)		·55706	16 17·70	25 50·47	−7·011	+4·984	+31·52	+ 9·14
	815	e			·56083	16 17·11	25 51·34	−7·108	+5·000	+31·52	+ 9·14
	816	e			·56325	16 16·74	25 51·89	−7·165	+5·010	+31·52	+ 9·14
XIV$_1$	818	f	Aug. 17.....	A	·28238	291 14 33·62	− 5 28 39·08	+4·990	+4·741	+31·51	+ 9·31
	819	f			·28686	14 33·03	28 40·14	+4·809	+4·727	+31·51	+ 9·31
	820	a	(3)		·29585	14 31·84	28 42·25	+4·433	+4·702	+31·34	+ 8·93
	821	a			·30169	14 31·08	28 43·62	+4·185	+4·686	+31·34	+ 8·93
	822	a			·30807	14 30·24	28 45·12	+3·905	+4·671	+31·34	+ 8·93
XIV$_2$	823	f	Aug. 18.....	G	·27898	291 12 38·40	− 5 32 35·55	+4·980	+4·707	+31·42	+ 9·36
	824	f			·28460	12 37·85	32 36·90	+4·756	+4·691	+31·42	+ 9·36
	825	a			·29115	12 37·20	32 38·47	+4·487	+4·672	+31·25	+ 8·98
	826	a			·29689	12 36·63	32 39·85	+4·244	+4·655	+31·25	+ 8·98
	827	a	(2)		·30251	12 36·07	32 41·20	+3·998	+4·642	+31·25	+ 8·98
	828	a			·30551	12 35·78	32 41·92	+3·867	+4·634	+31·25	+ 8·98
	829	f			·31193	12 35·15	32 43·46	+3·578	+4·620	+31·42	+ 9·36
	830	f			·31609	12 34·74	32 44·45	+3·390	+4·610	+31·42	+ 9·36
XIV$_3$	831	f	Aug. 19.....	A	·31540	291 11 13·03	− 5 36 46·97	+3·274	+4·569	+31·33	+ 9·40
	832	f			·31906	11 12·80	36 47·87	+3·105	+4·563	+31·33	+ 9·40
	833	a			·32402	11 12·47	36 49·08	+2·875	+4·554	+31·15	+ 9·02
	834	a			·32831	11 12·19	36 50·14	+2·669	+4·546	+31·15	+ 9·02
	835	a	(3)		·33423	11 11·81	36 51·58	+2·390	+4·536	+31·15	+ 9·02
	836	a			·33775	11 11·58	36 52·45	+2·221	+4·532	+31·15	+ 9·02
	837	f			·34458	11 11·14	36 54·12	+1·891	+4·522	+31·33	+ 9·40
	838	f			·34842	11 10·90	36 55·06	+1·701	+4·515	+31·33	+ 9·40
XIV$_4$	839	c	Aug. 19.....	G	·48203	291 11 2·61	− 5 37 27·89	−4·670	+4·643	+31·16	+ 9·27
	840	c			·48663	11 2·33	37 39·02	−4·853	+4·655	+31·16	+ 9·27
	841	d			·54157	10 59·12	37 42·54	−6·706	+4·850	+31·30	+ 9·16
	842	d			·55191	10 58·52	37 45·08	−6·972	+4·895	+31·30	+ 9·16
	843	d	(3)		·55520	10 58·33	37 45·89	−7·049	+4·908	+31·30	+ 9·16
	844	d			·55833	10 58·15	37 46·66	−7·119	+4·921	+31·30	+ 9·16
	845	c			·56390	10 57·82	37 48·03	−7·240	+4·945	+31·16	+ 9·27
	846	c			·56797	10 57·60	37 49·03	−7·323	+4·963	+31·16	+ 9·27

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
813	e	242 36	632·343	0·290	632·633	633·121	− 0·488	− 0·888	− 0·460	+ 0·382
814	e	242 33	633·882	0·307	634·189	634·141	+ 0·048	− 0·887	− 0·461	+ 0·389
815	e	242 31	634·882	0·322	635·204	635·142	+ 0·062	− 0·887	− 0·461	+ 0·397
816	e	242 29	635·531	0·333	635·864	635·771	+ 0·093	− 0·887	− 0·462	+ 0·402
818	f	235 23	3157·870	1·760	3159·630	3158·830	+ 0·800	− 0·823	− 0·568	− 0·678
819	f	235 22	3158·825	1·686	3160·511	3160·070	+ 0·441	− 0·823	− 0·568	− 0·663
820	a	61 27	3585·912	1·677	3587·589	3587·403	+ 0·186	+ 0·878	+ 0·478	+ 0·612
821	a	61 28	3583·601	1·600	3585·201	3585·867	− 0·666	+ 0·879	+ 0·478	+ 0·590
822	a	61 29	3581·780	1·522	3583·302	3584·162	− 0·860	+ 0·879	+ 0·477	+ 0·565
823	f	233 11	3387·359	1·920	3389·279	3389·942	− 0·663	− 0·801	− 0·599	− 0·679
824	f	233 11	3389·021	1·824	3390·845	3391·375	− 0·530	− 0·801	− 0·599	− 0·660
825	a	64 3	3375·211	1·597	3376·808	3377·725	− 0·917	+ 0·899	+ 0·438	+ 0·607
826	a	64 4	3374·081	1·524	3375·605	3376·383	− 0·778	+ 0·899	+ 0·437	+ 0·582
827	a	64 5	3372·992	1·458	3374·450	3375·068	− 0·618	+ 0·900	+ 0·437	+ 0·561
828	a	64 5	3372·245	1·426	3373·671	3374·372	− 0·701	+ 0·900	+ 0·437	+ 0·549
829	f	233 8	3396·482	1·474	3397·956	3398·440	− 0·484	− 0·800	− 0·600	− 0·562
830	f	233 7	3397·621	1·439	3399·060	3399·518	− 0·458	− 0·800	− 0·600	− 0·547
831	f	230 49	3612·500	1·528	3614·028	3613·020	+ 1·008	− 0·775	− 0·632	− 0·541
832	f	230 48	3612·445	1·495	3613·940	3613·898	+ 0·042	− 0·775	− 0·632	− 0·527
833	a	67 25	3195·291	1·161	3196·452	3196·201	+ 0·251	+ 0·923	+ 0·384	+ 0·439
834	a	67 26	3193·887	1·135	3195·022	3195·344	− 0·322	+ 0·923	+ 0·384	+ 0·420
835	a	67 27	3193·007	1·100	3194·107	3194·179	− 0·072	+ 0·924	+ 0·384	+ 0·394
836	a	67 28	3191·656	1·082	3192·738	3193·475	− 0·737	+ 0·924	+ 0·383	+ 0·377
837	f	230 46	3618·671	1·308	3619·979	3620·092	− 0·113	− 0·775	− 0·632	− 0·432
838	f	230 45	3620·130	1·285	3621·415	3621·017	+ 0·398	− 0·774	− 0·633	− 0·417
839	c	162 43	1785·736	0·871	1786·607	1787·398	− 0·791	+ 0·297	− 0·955	− 0·581
840	c	162 44	1786·504	0·894	1787·398	1788·322	− 0·924	+ 0·297	− 0·955	− 0·588
841	d	331 4	1125·850	1·086	1126·936	1126·313	+ 0·623	− 0·484	+ 0·875	+ 0·747
842	d	330 58	1123·735	1·287	1125·022	1124·549	+ 0·473	− 0·485	+ 0·874	+ 0·765
843	d	330 56	1123·505	1·368	1124·873	1123·980	+ 0·893	− 0·486	+ 0·874	+ 0·770
844	d	330 54	1122·445	1·451	1123·896	1123·438	+ 0·458	− 0·486	+ 0·874	+ 0·775
845	c	163 7	1801·155	2·166	1803·321	1804·201	− 0·880	+ 0·290	− 0·957	− 0·682
846	c	163 9	1801·454	2·359	1803·813	1805·062	− 1·249	+ 0·290	− 0·957	− 0·687

XIV_1 Rejected for discordance. Set incomplete and unsymmetrical, and pointings noted by Auwers as "very difficult and uncertain."

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	847	d	Aug. 20.....	A	·48956	291 10 19·14	− 5 41 37·81	−5·045	+4·637	+31·21	+ 9·20
	848	d			·49326	10 19·04	41 38·74	−5·186	+4·649	+31·21	+ 9·20
	849	d			·49763	10 18·92	41 39·83	−5·350	+4·662	+31·21	+ 9·20
	850	d			·50084	10 18·84	41 40·64	−5·466	+4·673	+31·21	+ 9·20
XIV_5	852	d	(3)		·51803	10 18·39	41 44·94	−6·052	+4·733	+31·21	+ 9·20
	853	d			·52495	10 18·22	41 46·68	−6·269	+4·759	+31·21	+ 9·20
	854	d			·52805	10 18 14	41 47·46	−6·361	+4·771	+31·21	+ 9·20
	855	d			·53088	10 18·07	41 48·16	−6·445	+4·783	+31·21	+ 9·20
	856	e	Aug. 21.....	A	·24748	291 10 8·64	− 5 44 48·62	+5·743	+4·675	+31·09	+ 9·35
	857	e			·25084	10 8·64	44 49·47	+5·627	+4·663	+31·09	+ 9·35
	858	b			·25666	10 8·63	44 50·94	+5·421	+4·643	+31·10	+ 9·05
	859	b			·26036	10 8·63	44 51·88	+5·287	+4·630	+31·10	+ 9·05
XIV_6	860	b	(3)		·26372	10 8·63	44 52·73	+5·160	+4·619	+31·10	+ 9·05
	861	b			·26768	10 8·63	44 53·73	+5·011	+4·606	+31·10	+ 9·05
	862	e			·27469	10 8·62	44 55·51	+4·737	+4·586	+31·09	+ 9·35
	863	e			·27945	10 8·62	44 56·71	+4·547	+4·571	+31·09	+ 9·35
	864	d	Aug. 21.....	G	·48617	291 10 9·32	− 5 45 49·19	−4·991	+4·597	+31·10	+ 9·23
	875	d	Aug. 22.....	G	·30602	291 10 26·13	− 5 49 18·74	+3·268	+4·459	+31·01	+ 9·26
	876	d			·30849	10 26·21	49 19·37	+3·155	+4·455	+31·01	+ 9·26
XV_1	877	d	(1)		·31076	10 26·29	49 19·95	+3·054	+4·449	+31·01	+ 9·26
	878	d			·31312	10 26·37	49 20·56	+2·944	+4·445	+31·01	+ 9·26
	883	d	Aug. 22.....	A	·49343	291 10 33·12	− 5 50 6·97	−5·328	+4·591	+30·99	+ 9·27
	884	d			·49600	10 33·22	50 7·63	−5·419	+4·600	+30·99	+ 9·27
	885	d			·49907	10 33·35	50 8·42	−5·528	+4·611	+30·99	+ 9·27
	886	d			·50175	10 33·46	50 9·11	−5·621	+4·620	+30·99	+ 9·27
XV_2	889	d	(3)		·51958	10 34·19	50 13·71	−6·195	+4·687	+30·99	+ 9·27
	890	d			·52311	10 34·34	50 14·62	−6·299	+4·701	+30·99	+ 9·27
	891	d			·52710	10 34·51	50 15·65	−6·412	+4·717	+30·99	+ 9·27
	892	d			·53052	10 34·65	50 16·54	−6·508	+4·732	+30·99	+ 9·27

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″				
847	d	322 9	950·286	0·548	950·834	950·068	+ 0·766	— 0·614	+ 0·790	+ 0·676
848	d	322 6	949·650	0·566	950·216	949·489	+ 0·727	— 0·614	+ 0·789	+ 0·684
849	d	322 3	948·748	0·590	949·338	948·808	+ 0·530	— 0·615	+ 0·789	+ 0·695
850	d	322 0	948·575	0·608	949·183	948·299	+ 0·884	— 0·616	+ 0·788	+ 0·703
852	d	321 48	945·112	0·736	945·848	945·595	+ 0·253	— 0·618	+ 0·786	+ 0·744
853	d	321 43	944·422	0·804	945·226	944·491	+ 0·735	— 0·620	+ 0·785	+ 0·761
854	d	321 41	943·777	0·840	944·617	943·992	+ 0·625	— 0·620	+ 0·785	+ 0·766
855	d	321 39	943·500	0·875	944·375	943·549	+ 0·826	— 0·620	+ 0·784	+ 0·773
856	e	212 39	1697·887	1·161	1699·048	1699·478	— 0·430	— 0·540	— 0·842	— 0·703
857	e	212 38	1698·429	1·121	1699·550	1700·322	— 0·772	— 0·539	— 0·842	— 0·694
858	b	31 30	2749·707	1·665	2751·372	2750·748	+ 0·624	+ 0·523	+ 0·853	+ 0·678
859	b	31 31	2747·649	1·606	2749·255	2749·869	— 0·614	+ 0·523	+ 0·852	+ 0·669
860	b	31 31	2747·071	1·559	2748·630	2749·069	— 0·439	+ 0·523	+ 0·852	+ 0·663
861	b	31 32	2747·292	1·507	2748·799	2748·131	+ 0·668	+ 0·523	+ 0·852	+ 0·654
862	e	212 33	1703·732	0·910	1704·642	1705·905	— 1·263	— 0·538	— 0·843	— 0·641
863	e	212 32	1706·589	0·878	1707·467	1707·034	+ 0·433	— 0·538	— 0·843	— 0·629
864	d	310 5	891·965	0·446	892·411	774·500				
875	d	296 59	636·971	0·178	637·149	636·856	+ 0·293	— 0·891	+ 0·454	— 0·088
876	d	296 56	637·036	0·178	637·214	636·597	+ 0·617	— 0·892	+ 0·453	— 0·078
877	d	296 53	636·593	0·177	636·770	636·357	+ 0·413	— 0·892	+ 0·452	— 0·070
878	d	296 50	636·503	0·177	636·680	636·108	+ 0·572	— 0·892	+ 0·451	— 0·061
883	d	292 56	618·168	0·369	618·537	617·969	+ 0·568	— 0·921	+ 0·390	+ 0·667
884	d	292 53	617·582	0·380	617·962	617·706	+ 0·256	— 0·921	+ 0·389	+ 0·676
885	d	292 49	617·419	0·393	617·812	617·385	+ 0·427	— 0·922	+ 0·388	+ 0·686
886	d	292 46	617·103	0·405	617·508	617·103	+ 0·405	— 0·922	+ 0·387	+ 0·694
889	d	292 23	615·236	0·513	615·749	615·226	+ 0·523	— 0·925	+ 0·381	+ 0·750
890	d	292 18	614·952	0·541	615·493	614·838	+ 0·655	— 0·925	+ 0·380	+ 0·759
891	d	292 13	614·625	0·575	615·200	614·400	+ 0·800	— 0·926	+ 0·378	+ 0·769
892	d	292 9	613·843	0·609	614·452	614·031	+ 0·421	— 0·926	+ 0·377	+ 0·778

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XV3	894	d	Aug. 23.....	A	·26059	291 11 14·12	− 5 53 25·55	+5·011	+4·537	+30·91	+ 9·30
	895	d			·26323	11 14·29	53 26·23	+4·911	+4·528	+30·91	+ 9·30
	896	d	(2)		·26593	11 14·47	53 26·93	+4·808	+4·521	+30·91	+ 9·30
	897	d			·26836	11 14·63	53 27·57	+4·714	+4·514	+30·91	+ 9·30
XV4	908	d	Aug. 23.....	G	·51074	291 11 31·74	− 5 54 30·68	−5·967	+4·627	+30·88	+ 9·31
	909	d			·51552	11 32·10	54 31·93	−6·113	+4·644	+30·88	+ 9·31
	910	d	(2)		·52186	11 32·58	54 33·58	−6·299	+4·670	+30·88	+ 9·31
	911	d			·52563	11 32·86	54 34·56	−6·404	+4·686	+30·88	+ 9·31
	912	d			·53051	11 33·23	54 35·84	−6·538	+4·706	+30·88	+ 9·31
	913	d			·53637	11 33·67	54 37·37	−6·686	+4·731	+30·88	+ 9·31
XV5	914	d	Aug. 24.....	A	·52046	291 13 4·34	− 5 58 55·30	−6·295	+4·640	+30·75	+ 9·34
	915	d			·52325	13 4·65	58 56·03	−6·372	+4·651	+30·75	+ 9·34
	916	d	(2)		·52754	13 5·11	58 57·16	−6·488	+4·668	+30·75	+ 9·34
	917	d			·53031	13 5·42	58 57·89	−6·559	+4·680	+30·75	+ 9·34
XV6	924	d	Aug. 26.....	G	·26819	291 17 5·78	− 6 6 38·73	+4·320	+4·375	+30·53	+ 9·39
	925	d			·27137	17 6·32	6 39·58	+4·193	+4·366	+30·53	+ 9·39
	926	d	(2)		·28363	17 8·38	6 42·85	+3·689	+4·333	+30·53	+ 9·39
	927	d			·28785	17 9·08	6 43·98	+3·509	+4·324	+30·53	+ 9·39
XV7	929	d	Aug. 26.....	A	·45613	291 17 37·86	− 6 7 28·90	−4·185	+4·358	+30·51	+ 9·40
	930	d			·46172	17 38·83	7 30·39	−4·407	+4·374	+30·51	+ 9·40
	931	d	(1)		·46481	17 39·37	7 31·22	−4·528	+4·383	+30·51	+ 9·40
	932	d			·46815	17 39·95	7 32·11	−4·657	+4·393	+30·51	+ 9·40
	913	d			·51963	17 48·97	7 45·86	−6·333	+4·584	+30·50	+ 9·40
	914	d			·52256	17 49·49	7 46·65	−6·408	+4·595	+30·50	+ 9·40

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
		° ′	″	″	″	″	″			
894	d	274 40	519·907	0·218	520·125	519·634	+ 0·491	— 0·997	+ 0·081	— 0·460
895	d	274 35	519·377	0·213	519·590	519·509	+ 0·081	— 0·997	+ 0·080	— 0·451
896	d	274 30	519·410	0·209	519·619	519·373	+ 0·246	— 0·997	+ 0·079	— 0·441
897		274 26	519·592	0·206	519·798	519·263	+ 0·535	— 0·997	+ 0·077	— 0·432
908	d	267 27	511·589	0·297	511·886	511·784	+ 0·102	— 0·999	— 0·045	+ 0·573
909	d	267 18	511·467	0·316	511·783	511·622	+ 0·161	— 0·999	— 0·047	+ 0·585
910	d	267 7	511·063	0·345	511·408	511·412	— 0·004	— 0·999	— 0·050	+ 0·603
911	d	267 1	510·967	0·363	511·330	511·282	+ 0·048	— 0·999	— 0·052	+ 0·612
912	d	266 52	510·554	0·392	510·946	511·121	— 0·175	— 0·998	— 0·055	+ 0·624
913	d	266 42	510·301	0·431	510·732	510·917	— 0·185	— 0·998	— 0·058	+ 0·637
914	d	235 34	508·059	0·178	508·237	508·416	— 0·179	— 0·825	— 0·566	+ 0·254
915	d	235 29	508·016	0·181	508·197	508·627	— 0·430	— 0·824	— 0·567	+ 0·258
916	d	235 22	508·902	0·187	509·089	508·978	+ 0·111	— 0·823	— 0·568	+ 0·266
917	d	235 17	508·938	0·190	509·128	509·192	— 0·064	— 0·822	— 0·570	+ 0·269
924	d	192 38	768·752	0·346	769·098	769·862	— 0·764	— 0·219	— 0·976	— 0·521
925	d	192 35	769·709	0·341	770·050	770·612	— 0·562	— 0·218	— 0·976	— 0·518
926	d	192 26	772·565	0·327	772·892	773·507	— 0·615	— 0·215	— 0·977	— 0·502
927	d	192 22	773·541	0·323	773·864	774·510	— 0·646	— 0·214	— 0·977	— 0·497
929	d	190 15	813·554	0·293	813·847	814·419	— 0·572	— 0·178	— 0·984	— 0·355
930	d	190 11	814·948	0·297	815·245	815·743	— 0·498	— 0·177	— 0·984	— 0·352
931	d	190 8	815·711	0·297	816·008	816·477	— 0·469	— 0·176	— 0·984	— 0·352
932	d	190 6	816·128	0·299	816·427	817·264	— 0·837	— 0·175	— 0·985	— 0·351
943	d	189 26	828·865	0·363	829·228	829·386	— 0·158	— 0·164	— 0·986	— 0·349
944	d	189 24	829·073	0·371	829·444	830·074	— 0·630	— 0·163	— 0·987	— 0·349

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TABLE B.—YALE DISTANCES,

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
II_6	1	μ	June 17.....	H	·71680	300 33 55·21	− 7 44 45·95	+4·772	−6·939	+23·07	+ 4·87
	2	θ			·72881	33 52·40	44 39·46	+4·459	−6·986	+23·25	+ 4·35
	3	θ			·73589	33 50·74	44 35·64	+4·201	−7·012	+23·25	+ 4·35
	4	μ	(2)		·74516	33 48·57	44 30·63	+3·847	−7·047	+23·08	+ 4·88
	5	μ			·75419	33 46·45	44 25·76	+3·492	−7·071	+23·08	+ 4·88
	6	θ			·76209	33 44·58	44 21·49	+3·169	−7·093	+23·26	+ 4·36
	7	θ			·77024	33 42·66	44 17·09	+2·829	−7·114	+23·26	+ 4·36
	8	μ			·77710	33 41·04	44 13·38	+2·538	−7·130	+23·10	+ 4·88
II_7	9	μ	June 18.....	E	·72196	300 29 44·70	− 7 35 47·42	+4·625	−7·000	+23·42	+ 4·99
	10	θ			·72630	29 43·55	35 45·12	+4·471	−7·019	+23·58	+ 4·48
	11	θ			·73001	29 42·57	35 43·15	+4·332	−7·032	+23·58	+ 4·48
	12	μ	(2)		·73340	29 41·67	35 41·35	+4·206	−7·044	+23·43	+ 4·99
	13	μ			·73624	29 40·92	35 39·84	+4·101	−7·053	+23·43	+ 4·99
	14	θ			·73935	29 40·09	35 38·19	+3·982	−7·064	+23·58	+ 4·49
	15	θ			·74272	29 39·20	35 36·40	+3·851	−7·074	+23·58	+ 4·49
	16	μ			·74690	29 38·09	35 34·18	+3·687	−7·088	+23·43	+ 4·98
III_7	19	λ	June 20.....	E	·71897	300 19 56·92	− 7 18 25·37	+4·572	−7·073	+24·10	+ 4·87
	21	λ	(2)		·72422	19 55·22	18 22·69	+4·376	−7·091	+24·10	+ 4·87
	23	λ			·72912	19 53·63	18 20·18	+4·190	−7·107	+24·10	+ 4·87
	25	λ			·73467	19 51·83	18 17·34	+3·975	−7·127	+24·10	+ 4·87
III_8	32	λ	June 20.....	H	·78741	300 19 34·68	− 7 17 50·35	+1·731	−7·249	+24·13	+ 4·88
	34	λ			·79122	19 33·44	17 48·40	+1·560	−7·255	+24·13	+ 4·88
	36	λ			·80318	19 29·54	17 42·29	+1·011	−7·266	+24·13	+ 4·88
	38	λ	(2)		·80650	19 28·46	17 40·59	+0·856	−7·269	+24·13	+ 4·88
	40	λ			·81724	19 24·95	17 35·10	+0·359	−7·274	+24·13	+ 4·88
	42	λ			·82064	19 23·83	17 33·37	+0·200	−7·274	+24·13	+ 4·88
III_9	46	λ	June 22.....	E	·71030	300 8 14·28	− 7 1 45·92	+4·716	−7·119	+24·75	+ 5·12
	48	θ			·71654	8 11·91	1 42·84	+4·486	−7·140	+24·87	+ 5·00
	50	θ			·72130	8 10·09	1 40·50	+4·307	−7·157	+24·87	+ 5·00
	52	λ			·72625	8 8·16	1 38·03	+4·112	−7·173	+24·75	+ 5·12
	54	λ	(2)		·73107	8 6·35	1 35·71	+3·924	−7·187	+24·75	+ 5·12
	56	θ			·73589	8 4·51	1 33·34	+3·730	−7·202	+24·88	+ 5·00
	58	θ			·74024	8 2·85	1 31·21	+3·550	−7·214	+24·88	+ 5·00
	60	λ			·74452	8 1·21	1 29·10	+3·370	−7·224	+24·76	+ 5·13

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COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f'	f''
		° ′	r	r	″	″	″			
1	μ	333 9	452·282	0·593	5734·53	5732·48	+ 2·05	− 0·452	+ 0·892	− 0·833
2	θ	140 17	313·016	0·329	3968·76	3969·13	− 0·37	+ 0·639	− 0·769	+ 0·820
3	θ	140 17	312·663	0·302	3964·29	3964·99	− 0·70	+ 0·639	− 0·769	+ 0·805
4	μ	333 9	453·525	0·439	5750·29	5749·43	+ 0·86	− 0·452	+ 0·892	− 0·801
5	μ	333 9	454·051	0·406	5756·96	5754·86	+ 2·10	− 0·452	+ 0·892	− 0·787
6	θ	140 13	311·476	0·233	3949·24	3949·62	− 0·38	+ 0·640	− 0·768	+ 0·746
7	θ	140 13	311·072	0·219	3944·11	3944·82	− 0·71	+ 0·640	− 0·768	+ 0·726
8	μ	333 9	455·085	0·344	5770·07	5768·71	+ 1·36	− 0·452	+ 0·892	− 0·750
9	μ	333 21	498·818	0·606	6325·81	6325·19	+ 0·62	− 0·449	+ 0·894	− 0·832
10	θ	137 44	268·390	0·282	3403·62	3403·91	− 0·29	+ 0·673	− 0·740	+ 0·817
11	θ	137 44	268·205	0·269	3401·27	3401·72	− 0·45	+ 0·673	− 0·740	+ 0·809
12	μ	333 21	499·426	0·536	6333·52	6332·12	+ 1·40	− 0·449	+ 0·894	− 0·816
13	μ	333 21	499·578	0·522	6335·45	6333·85	+ 1·60	− 0·449	+ 0·894	− 0·812
14	θ	137 43	267·765	0·243	3395·69	3396·19	− 0·50	+ 0·673	− 0·740	+ 0·787
15	θ	137 42	267·596	0·234	3393·54	3394·19	− 0·65	+ 0·673	− 0·740	+ 0·780
16	μ	333 20	500·004	0·473	6340·85	6340·32	+ 0·53	− 0·449	+ 0·894	− 0·798
19	λ	275 5	102·804	0·060	1303·72	1304·10	− 0·38	− 0·996	+ 0·089	− 0·515
21	λ	275 12	102·971	0·056	1305·84	1306·21	− 0·37	− 0·996	+ 0·091	− 0·498
23	λ	275 18	103·133	0·053	1307·89	1308·19	− 0·30	− 0·996	+ 0·092	− 0·479
25	λ	275 25	103·337	0·050	1310·48	1310·44	+ 0·04	− 0·996	+ 0·094	− 0·460
32	λ	276 29	105·027	0·034	1331·65	1332·41	− 0·76	− 0·994	+ 0·113	− 0·253
34	λ	276 34	105·210	0·033	1333·97	1334·02	− 0·05	− 0·993	+ 0·114	− 0·237
36	λ	276 48	105·648	0·032	1339·52	1339·11	+ 0·41	− 0·993	+ 0·120	− 0·186
38	λ	276 52	105·720	0·032	1340·43	1340·53	− 0·10	− 0·993	+ 0·120	− 0·172
40	λ	277 5	106·115	0·030	1345·44	1345·14	+ 0·30	− 0·992	+ 0·123	− 0·124
42	λ	277 9	106·163	0·030	1346·05	1346·62	− 0·57	− 0·992	+ 0·124	− 0·110
46	λ	299 10	180·369	0·172	2287·37	2287·08	+ 0·29	− 0·873	+ 0·487	− 0·756
48	θ	115 22	87·801	0·071	1113·46	1114·69	− 1·23	+ 0·904	− 0·428	+ 0·709
50	θ	115 18	87·589	0·067	1110·77	1111·90	− 1·13	+ 0·904	− 0·427	+ 0·693
52	λ	299 16	181·165	0·141	2297·46	2296·74	+ 0·72	− 0·872	+ 0·489	− 0·707
54	λ	299 17	181·385	0·134	2300·25	2299·59	+ 0·66	− 0·872	+ 0·489	− 0·691
56	θ	115 6	86·885	0·055	1101·84	1103·33	− 1·49	+ 0·906	− 0·424	+ 0·641
58	θ	115 3	86·799	0·053	1100·75	1100·77	− 0·02	+ 0·906	− 0·423	+ 0·624
60	λ	299 22	181·988	0·116	2307·90	2307·74	+ 0·16	− 0·872	+ 0·490	− 0·646

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III_{10}	62	λ	June 22.....	H	·75638	300 7 56·68	− 7 1 23·28	+2·865	−7·252	+24·76	+ 5·13
	64	θ	(2)		·76884	7 51·91	1 17·16	+2·316	−7·279	+24·89	+ 5·01
	66	θ			·77806	7 48·38	1 12·64	+1·900	−7·295	+24·89	+ 5·01
	68	λ			·79104	7 43·40	1 6·26	+1·306	−7·310	+24·77	+ 5·13
III_{11}	72	θ	June 23.....	E	·75817	300 1 19·24	− 6 53 16·95	+2·670	−7·289	+25·20	+ 5·13
	74	θ	(2)		·76199	1 17·67	53 15·12	+2·503	−7·297	+25·20	+ 5·13
	76	θ			·76512	1 16·38	53 13·61	+2·361	−7·303	+25·20	+ 5·13
	78	θ			·76842	1 15·03	53 12·03	+2·215	−7·308	+25·20	+ 5·13
	80	θ			·77120	1 13·89	53 10·70	+2·089	−7·313	+25·20	+ 5·13
	82	θ			·77428	1 12·62	53 9·22	+1·946	−7·319	+25·20	+ 5·13
	84	θ			·77682	1 11·58	53 8·00	+1·832	−7·322	+25·20	+ 5·13
	86	θ			·77938	1 10·52	53 6·77	+1·715	−7·326	+25·20	+ 5·13
III_{12}	92	θ	June 23.....	H	·86324	300 0 35·94	− 6 52 26·60	−2·208	−7·311	+25·23	+ 5·14
	94	θ	(2)		·86617	0 34·73	52 25·19	−2·343	−7·306	+25·23	+ 5·14
	96	θ			·87708	0 30·21	52 19·97	−2·824	−7·284	+25·23	+ 5·14
	98	θ			·87973	0 29·12	52 18·70	−2·939	−7·278	+25·23	+ 5·14
IV_{10}	100	ε	June 26.....	E	·72401	299 39 2·91	− 6 30 24·71	+3·790	−7·302	+26·12	+ 5·22
	101	λ	(3)		·73016	38 59·90	30 21·98	+3·531	−7·318	+25·99	+ 5·62
	102	λ			·73318	38 58·42	30 20·63	+3·413	−7·325	+25·99	+ 5·62
	103	ε			·73600	38 57·04	30 19·38	+3·280	−7·332	+26·13	+ 5·23
	104	ε			·73833	38 55·90	30 18·34	+3·179	−7·337	+26·13	+ 5·23
	105	λ			·74142	38 54·39	30 16·97	+3·041	−7·344	+25·99	+ 5·63
	106	λ			·74629	38 52·00	30 14·80	+2·598	−7·355	+25·99	+ 5·63
	107	ε			·75283	38 48·80	30 11·89	+2·537	−7·366	+26·13	+ 5·23
	108	ε			·75709	38 46·71	30 9·99	+2·341	−7·373	+26·13	+ 5·23
	109	λ			·75987	38 45·35	30 8·76	+2·214	−7·378	+26·00	+ 5·63
	110	λ			·76221	38 44·20	30 7·72	+2·106	−7·382	+26·00	+ 5·63
IV_{2}	111	ε	June 27.....	E	·69052	299 30 58·35	− 6 23 20·49	+4·997	−7·228	+26·39	+ 5·35
	112	λ	( )		·69404	30 56·55	23 18·97	+4·867	−7·241	+26·28	+ 5·74
	113	λ			·69693	30 55·07	23 17·72	+4·758	−7·251	+26·28	+ 5·74
	114	ε			·70013	30 53·42	23 16·33	+4·638	−7·261	+26·40	+ 5·35
	115	ε			·70235	30 52·28	23 15·37	+4·553	−7·269	+26·40	+ 5·35
	116	λ			·70536	30 50·74	23 14·07	+4·438	−7·278	+26·28	+ 5·74
	117	λ			·70806	30 49·35	23 12·90	+4·329	−7·287	+26·28	+ 5·74
	118	ε			·71132	30 47·68	23 11·49	+4·199	−7·296	+26·40	+ 5·35

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
62	λ	299 26	182·691	0·103	2316·36	2314·94	+ 1·42	− 0·871	+ 0·491	− 0·604
64	θ	114 39	85·419	0·040	1083·04	1083·94	− 0·90	+ 0·909	− 0·417	+ 0·513
66	θ	114 31	85·122	0·037	1079·27	1078·50	+ 0·77	+ 0·910	− 0·415	+ 0·475
68	λ	299 37	184·367	0·080	2337·61	2336·12	+ 1·49	− 0·869	+ 0·494	− 0·474
72	θ	87 18	46·887	0·015	594·60	596·18	− 1·58	+ 0·999	+ 0·047	+ 0·231
74	θ	87 7	46·846	0·014	594·08	594·55	− 0·47	+ 0·999	+ 0·050	+ 0·212
76	θ	86 58	46·721	0·014	592·50	593·21	− 0·71	+ 0·999	+ 0·053	+ 0·195
78	θ	86 49	46·561	0·014	590·47	591·81	− 1·34	+ 0·998	+ 0·056	+ 0·179
80	θ	86 40	46·446	0·014	589·01	590·63	− 1·62	+ 0·998	+ 0·058	+ 0·165
82	θ	86 31	46·421	0·014	588·69	589·32	− 0·63	+ 0·998	+ 0·061	+ 0·148
84	θ	86 24	46·348	0·014	587·77	588·25	− 0·48	+ 0·998	+ 0·063	+ 0·135
86	θ	86 16	46·315	0·014	587·35	587·17	+ 0·18	+ 0·998	+ 0·065	+ 0·122
92	θ	81 52	43·599	0·016	552·80	553·25	− 0·45	+ 0·990	+ 0·141	− 0·320
94	θ	81 42	43·609	0·016	552·92	552·13	+ 0·79	+ 0·990	+ 0·144	− 0·335
96	θ	81 5	43·223	0·017	548·03	548·01	+ 0·02	+ 0·988	+ 0·155	− 0·390
98	θ	80 56	43·169	0·018	547·34	547·02	+ 0·32	+ 0·988	+ 0·158	− 0·403
100	ε	154 55	380·290	0·306	4822·69	4823·40	− 0·71	+ 0·424	− 0·906	+ 0·821
101	λ	308 42	378·144	0·271	4795·47	4794·93	+ 0·54	− 0·780	+ 0·625	− 0·732
102	λ	308 42	378·318	0·263	4797·68	4797·01	+ 0·67	− 0·780	+ 0·625	− 0·722
103	ε	154 58	379·655	0·281	4814·63	4815·92	− 1·29	+ 0·423	− 0·906	+ 0·802
104	ε	154 58	379·492	0·277	4812·57	4814·46	− 1·89	+ 0·423	− 0·906	+ 0·799
105	λ	308 42	378·735	0·244	4802·96	4802·70	+ 0·26	− 0·780	+ 0·625	− 0·695
106	λ	308 42	378·992	0·234	4806·23	4806·24	− 0·01	− 0·780	+ 0·625	− 0·662
107	ε	155 1	378·891	0·253	4804·94	4805·40	− 0·46	+ 0·422	− 0·906	+ 0·775
108	ε	155 2	378·720	0·247	4802·77	4802·71	+ 0·06	+ 0·422	− 0·907	+ 0·766
109	λ	308 42	379·813	0·211	4816·64	4815·47	+ 1·17	− 0·780	+ 0·625	− 0·632
110	λ	308 42	379·912	0·207	4817·89	4817·09	+ 0·80	− 0·780	+ 0·625	− 0·625
111	ε	158 22	334·467	0·350	4241·58	4243·10	− 1·52	+ 0·369	− 0·930	+ 0·856
112	λ	309 1	428·520	0·451	5434·32	5433·53	+ 0·79	− 0·777	+ 0·630	− 0·832
113	λ	309 1	428·662	0·434	5436·12	5435·54	+ 0·58	− 0·777	+ 0·630	− 0·825
114	ε	158 25	334·098	0·317	4236·90	4237·33	− 0·43	+ 0·368	− 0·930	+ 0·845
115	ε	158 26	333·993	0·311	4235·57	4235·99	− 0·42	+ 0·368	− 0·930	+ 0·843
116	λ	309 1	429·073	0·394	5441·33	5441·41	− 0·08	− 0·777	+ 0·630	− 0·802
117	λ	309 1	429·308	0·380	5444·31	5443·29	+ 1·02	− 0·777	+ 0·630	− 0·794
118	ε	158 28	333·563	0·290	4230·11	4230·60	− 0·49	+ 0·367	− 0·930	+ 0·832

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
IV_{21}	119	γ	June 29.....	E	·70231	299 12 57·51	− 6 9 15·96	+4·345	−7·330	+26·95	+ 5·50
	120	λ			·70663	12 55·09	9 14·20	+4·169	−7·343	+26·86	+ 5·98
	121	λ			·70988	12 53·27	9 12·88	+4·033	−7·352	+26·86	+ 5·98
	122	γ			·71314	12 51·44	9 11·56	+3·899	−7·361	+26·95	+ 5·50
	123	γ	( )		·71611	12 49·77	9 10·36	+3·773	−7·368	+26·95	+ 5·50
	124	λ			·72044	12 47·34	9 8·60	+3·588	−7·379	+26·86	+ 5·98
	125	λ			·72336	12 45·70	9 7·41	+3·461	−7·386	+26·86	+ 5·98
	126	γ			·72640	12 44·00	9 6·18	+3·329	−7·393	+26·96	+ 5·51
IV_{22}	127	η	June 29.....	E	·74561	299 12 33·22	− 6 8 58·38	+2·467	−7·431	+26·90	+ 5·59
	128	ζ			·74941	12 31·09	8 56·84	+2·292	−7·438	+27·12	+ 5·98
	129	ζ			·75236	12 29·44	8 55·64	+2·152	−7·443	+27·12	+ 5·98
	130	η			·75559	12 27·62	8 54·33	+2·000	−7·448	+26·90	+ 5·59
	131	η	(2)		·76426	12 22·75	8 50·81	+1·591	−7·458	+26·90	+ 5·59
	132	ζ			·76725	12 21·07	8 49·59	+1·448	−7·461	+27·12	+ 5·98
	133	ζ			·77140	12 18·74	8 47·91	+1·251	−7·465	+27·12	+ 5·98
	134	η			·77635	12 15·96	8 45·90	+1·014	−7·469	+26·90	+ 5·59
V_9	135	β	July 4	E	·70271	298 21 56·94	− 5 38 17·06	+3·730	−7·460	+28·28	+ 6·11
	136	δ			·70682	21 54·23	38 15·68	+3·552	−7·468	+28·34	+ 6·36
	137	δ			·70934	21 52·57	38 14·83	+3·437	−7·474	+28·34	+ 6·36
	138	β			·71235	21 50·58	38 13·82	+3·305	−7·482	+28·28	+ 6·11
	139	β			·71537	21 48·59	38 12·81	+3·165	−7·488	+28·28	+ 6·11
	140	δ			·71902	21 46·19	38 11·58	+2·998	−7·495	+28·35	+ 6·36
	141	δ	(2)		·72174	21 44·40	38 10·67	+2·873	−7·501	+28·35	+ 6·36
	142	β			·72463	21 42·49	38 9·70	+2·740	−7·505	+28·28	+ 6·11
	143	β			·72721	21 40·79	38 8·83	+2·622	−7·510	+28·28	+ 6·11
	144	δ			·72977	21 39·10	38 7·97	+2·501	−7·514	+28·35	+ 6·36
	145	δ			·73193	21 37·68	38 7·24	+2·403	−7·517	+28·35	+ 6·36
	146	β			·73475	21 35·82	38 6·30	+2·267	−7·521	+28·29	+ 6·11
V_{10}	147	z	July 5	H	·77993	298 9 58·02	− 5 32 23·97	−0·096	−7·566	+28·61	+ 6·31
	149	z			·78289	9 56·02	32 23·03	−0·240	−7·566	+28·61	+ 6·31
	151	z			·79473	9 48·01	32 19·24	−0·826	−7·562	+28·61	+ 6·31
	153	z	(2)		·79780	9 45·94	32 18·26	−0·984	−7·560	+28·61	+ 6·31
	155	z			·80855	9 38·67	32 14·83	−1·509	−7·553	+28·61	+ 6·31
	157	z			·81147	9 36·70	32 13·90	−1·651	−7·551	+28·61	+ 6·31

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
119	γ	163 6	457·873	0·385	5806·56	5807·28	− 0·72	+ 0·291	− 0·957	+ 0·827
120	λ	308 50	536·374	0·445	6802·08	6801·36	+ 0·72	− 0·779	+ 0·627	− 0·783
121	λ	308 50	536·559	0·430	6804·43	6803·69	+ 0·74	− 0·779	+ 0·627	− 0·773
122	γ	163 9	457·391	0·356	5800·45	5801·22	− 0·77	+ 0·290	− 0·957	+ 0·816
123	γ	163 10	457·329	0·349	5799·66	5799·56	+ 0·10	+ 0·290	− 0·957	+ 0·814
124	λ	308 50	537·166	0·386	6812·13	6811·29	+ 0·84	− 0·779	+ 0·627	− 0·741
125	λ	308 50	537·327	0·375	6814·17	6813·40	+ 0·77	− 0·779	+ 0·627	− 0·731
126	γ	163 13	456·817	0·327	5793·17	5793·80	− 0·63	+ 0·289	− 0·957	+ 0·803
127	η	186 28	346·147	0·204	4389·70	4391·41	− 1·71	− 0·113	− 0·994	+ 0·711
128	ζ	357 54	525·922	0·348	6669·53	6668·48	+ 1·05	− 0·037	+ 0·999	− 0·751
129	ζ	357 54	526·023	0·345	6670·81	6669·75	+ 1·06	− 0·037	+ 0·999	− 0·751
130	η	186 33	345·997	0·202	4387·80	4388·09	− 0·29	− 0·114	− 0·993	+ 0·717
131	η	186 38	345·722	0·200	4384·31	4385·21	− 0·90	− 0·116	− 0·993	+ 0·723
132	ζ	357 49	526·601	0·336	6678·14	6676·11	+ 2·03	− 0·038	+ 0·999	− 0·751
133	ζ	357 48	526·673	0·334	6679·06	6677·87	+ 1·19	− 0·038	+ 0·999	− 0·751
134	η	186 44	345·413	0·200	4380·39	4381·20	− 0·81	− 0·117	− 0·993	+ 0·731
135	β	168 34	285·873	0·209	3625·33	3626·40	− 1·07	+ 0·198	− 0·980	+ 0·805
136	δ	331 55	334·361	0·260	4240·23	4238·41	+ 1·82	− 0·471	+ 0·882	− 0·825
137	δ	331 54	334·385	0·255	4240·54	4239·98	+ 0·56	− 0·471	+ 0·882	− 0·820
138	β	168 39	285·518	0·199	3620·82	3621·91	− 1·09	+ 0·197	− 0·980	+ 0·798
139	β	168 41	285·447	0·196	3619·92	3620·51	− 0·59	+ 0·196	− 0·981	+ 0·797
140	δ	331 51	334·915	0·240	4247·26	4246·02	+ 1·24	− 0·472	+ 0·882	− 0·803
141	δ	331 50	334·927	0·235	4247·41	4247·73	− 0·32	− 0·472	+ 0·882	− 0·797
142	β	168 47	285·087	0·188	3615·36	3616·21	− 0·85	+ 0·195	− 0·981	+ 0·790
143	β	168 48	284·931	0·186	3613·38	3615·01	− 1·63	+ 0·194	− 0·981	+ 0·788
144	δ	331 47	335·351	0·225	4252·79	4252·76	+ 0·03	− 0·473	+ 0·881	− 0·780
145	δ	331 46	335·476	0·222	4254·37	4254·11	+ 0·26	− 0·473	+ 0·881	− 0·776
146	β	168 53	284·721	0·181	3610·72	3611·51	− 0·79	+ 0·193	− 0·981	+ 0·782
147	z	113 3	44·119	0·014	559·39	559·25	+ 0·14	+ 0·920	− 0·392	+ 0·288
149	z	113 3	43·822	0·014	555·62	556·93	− 1·31	+ 0·920	− 0·392	+ 0·275
151	z	113 2	43·151	0·014	547·12	547·56	− 0·44	+ 0·920	− 0·391	+ 0·221
153	z	113 1	42·776	0·013	542·36	545·14	− 2·78	+ 0·920	− 0·391	+ 0·206
155	z	113 1	42·275	0·012	536·01	536·65	− 0·64	+ 0·920	− 0·391	+ 0·157
157	z	113 0	42·133	0·012	534·21	534·36	− 0·15	+ 0·921	− 0·391	+ 0·144

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
V_{11} *	163	z	July 6	E	·68617	297° 59′ 39″·46	− 5° 27′ 40″·46	+4″·184	−7″·463	+28″·82	+ 6″·41
	165	z			·68940	59 37·23	27 39·47	+4·046	−7·470	+28·82	+ 6·41
	167	z			·69292	59 34·81	27 38·39	+3·897	−7·478	+28·82	+ 6·41
	169	z			·69584	59 32·79	27 37·50	+3·766	−7·484	+28·82	+ 6·41
	171	z	(2)		·69882	59 30·74	27 36·59	+3·636	−7·490	+28·82	+ 6·41
	173	z			·70314	59 27·77	27 35·27	+3·445	−7·501	+28·82	+ 6·41
	175	z			·70602	59 25·78	27 34·39	+3·315	−7·508	+28·82	+ 6·41
	177	z			·70963	59 23·29	27 33·28	+3·152	−7·515	+28·82	+ 6·41
V_{12} *	179	z	July 6	H	·72088	297 59 15·54	− 5 27 29·84	+2·630	−7·535	+28·82	+ 6·41
	181	z			·72984	59 9·36	27 27·10	+2·202	−7·548	+28·82	+ 6·41
	183	z			·73726	59 4·24	27 24·84	+1·847	−7·558	+28·83	+ 6·41
	185	z	(2)		·74554	58 58·53	27 22·31	+1·446	−7·564	+28·83	+ 6·41
	187	z			·75246	58 53·76	27 20·20	+1·106	−7·571	+28·83	+ 6·41
	189	z			·76032	58 48·33	27 17·80	+0·715	−7·574	+28·83	+ 6·41
V_{13}	195	z	July 7	H	·65934	297 48 22·45	− 5 22 49·91	+5·141	−7·408	+29·03	+ 6·52
	197	z			·66248	48 20·24	22 49·00	+5·023	−7·418	+29·03	+ 6·52
	199	z			·67222	48 13·41	22 46·17	+4·635	−7·445	+29·03	+ 6·52
	201	z	(1)		·67447	48 11·83	22 45·51	+4·547	−7·451	+29·03	+ 6·52
	203	z			·68331	48 5·62	22 42·94	+4·178	−7·475	+29·03	+ 6·52
	205	z			·68537	48 4·17	22 42·34	+4·090	−7·479	+29·03	+ 6·52
V_{14}	211–12	z	July 7	E	·74910	297 47 19·37	− 5 22 23·86	+1·113	−7·579	+29·05	+ 6·53
	213	z			·75412	47 15·84	22 22·40	+0·862	−7·582	+29·05	+ 6·53
	215	z			·75890	47 12·48	22 21·02	+0·625	−7·584	+29·05	+ 6·53
	217	z	(1)		·76460	47 8·48	22 19·36	+0·342	−7·586	+29·05	+ 6·53
	219	z			·76907	47 5·33	22 18·07	+0·118	−7·586	+29·05	+ 6·53
	221	z			·77367	47 2·09	22 16·73	−0·111	−7·586	+29·05	+ 6·53
VI_5 †	227	w	July 12.....	H	·66696	296 47 34·59	− 5 1 48·40	+4·216	−7·514	+30·06	+ 6·97
	229	w			·67518	47 28·44	1 46·66	+3·855	−7·531	+30·06	+ 6·97
	231	w	(2)		·68280	47 22·73	1 45·04	+3·514	−7·548	+30·06	+ 6·97
	233	w			·69508	47 13·53	1 42·44	+2·950	−7·570	+30·06	+ 6·97
	235	w			·70593	47 5·39	1 40·14	+2·432	−7·586	+30·06	+ 6·97
VI_6	241	w	July 12.....	E	·74801	296 46 33·83	− 5 1 31·24	+0·352	−7·620	+30·07	+ 6·98
	243	w			·75444	46 29·01	1 29·89	+0·031	−7·620	+30·07	+ 6·98
	245	w			·76196	46 23·37	1 28·30	−0·349	−7·618	+30·07	+ 6·98
	247	w	(1)		·77209	46 15·77	1 26·16	−0·856	−7·615	+30·07	+ 6·98
	249	w			·78017	46 9·71	1 24·46	−1·261	−7·609	+30·07	+ 6·98
	251	w			·78439	46 6·55	1 23·57	−1·469	−7·607	+30·07	+ 6·98

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
163	z	303 39	9·159	0·006	116·15	116·57	− 0·42	− 0·832	+ 0·554	− 0·759
165	z	303 25	9·290	0·006	117·81	119·07	− 1·26	− 0·835	+ 0·551	− 0·749
167	z	303 10	9·571	0·006	121·38	121·79	− 0·41	− 0·837	+ 0·547	− 0·733
169	z	302 59	9·712	0·006	123·16	124·07	− 0·91	− 0·839	+ 0·544	− 0·722
171	z	302 47	9·927	0·006	125·89	126·38	− 0·49	− 0·841	+ 0·541	− 0·710
173	z	302 31	10·203	0·006	129·39	129·74	− 0·35	− 0·843	+ 0·538	− 0·693
175	z	302 21	10·415	0·006	132·08	131·99	+ 0·09	− 0·845	+ 0·535	− 0·682
177	z	302 8	10·504	0·006	133·20	134·81	− 0·61	− 0·847	+ 0·532	− 0·666
179	z	301 33	11·348	0·006	143·88	143·61	+ 0·27	− 0·852	+ 0·523	− 0·617
181	z	301 7	11·859	0·006	150·36	150·65	− 0·29	− 0·856	+ 0·517	− 0·577
183	z	300 48	12·304	0·006	156·00	156·49	− 0·49	− 0·859	+ 0·512	− 0·545
185	z	300 28	12·809	0·006	162·41	163·01	− 0·60	− 0·862	+ 0·507	− 0·507
187	z	300 12	13·277	0·006	168·34	168·46	− 0·12	− 0·864	+ 0·503	− 0·476
189	z	299 56	13·824	0·006	175·28	174·68	+ 0·60	− 0·867	+ 0·499	− 0·440
195	z	294 45	66·932	0·057	848·64	848·17	+ 0·47	− 0·908	+ 0·419	− 0·775
197	z	294 44	67·126	0·054	851·09	850·65	+ 0·44	− 0·908	+ 0·418	− 0·764
199	z	294 42	67·681	0·048	858·13	858·34	− 0·21	− 0·909	+ 0·418	− 0·731
201	z	294 42	67·794	0·047	859·57	860·13	− 0·56	− 0·909	+ 0·418	− 0·723
203	z	294 40	68·364	0·043	866·79	867·14	− 0·35	− 0·909	+ 0·417	− 0·690
205	z	294 40	68·527	0·042	868·86	868·79	+ 0·07	− 0·909	+ 0·417	− 0·682
211–12	z	294 28	72·468	0·026	919·01	919·71	− 0·70	− 0·910	+ 0·414	− 0·415
213	z	294 27	72·788	0·026	923·07	923·74	− 0·67	− 0·910	+ 0·414	− 0·392
215	z	294 26	73·113	0·026	927·19	927·56	− 0·37	− 0·910	+ 0·414	− 0·371
217	z	294 26	73·545	0·024	932·67	932·13	+ 0·54	− 0·910	+ 0·414	− 0·345
219	z	294 25	73·792	0·024	935·80	935·72	+ 0·08	− 0·911	+ 0·413	− 0·324
221	z	294 24	74·003	0·024	938·48	939·42	− 0·94	− 0·911	+ 0·413	− 0·303
227	w	203 47	54·359	0·026	689·22	689·06	+ 0·16	− 0·403	− 0·915	+ 0·518
229	w	204 20	54·372	0·026	689·39	690·14	− 0·75	− 0·412	− 0·911	+ 0·528
231	w	204 51	54·560	0·025	691·77	691·19	+ 0·58	− 0·420	− 0·907	+ 0·538
233	w	205 40	54·608	0·024	692·38	693·01	− 0·63	− 0·433	− 0·901	+ 0·555
235	w	206 23	54·781	0·025	694·57	694·74	− 0·17	− 0·444	− 0·896	+ 0·573
241	w	209 10	55·307	0·026	701·38	702·53	− 1·15	− 0·487	− 0·873	+ 0·648
243	w	209 35	55·453	0·026	703·23	703·86	− 0·63	− 0·494	− 0·870	+ 0·662
245	w	210 4	55·499	0·028	703·82	705·47	− 1·65	− 0·501	− 0·865	+ 0·676
247	w	210 43	55·765	0·029	707·19	707·71	− 0·52	− 0·511	− 0·860	+ 0·699
249	w	211 14	55·895	0·030	708·84	709·56	− 0·72	− 0·519	− 0·855	+ 0·716
251	w	211 30	55·939	0·030	709·40	710·54	− 1·14	− 0·523	− 0·853	+ 0·726

* V_{11}, V_{12}. Rejected because of the uncertainty of the correction for "crossing through" in so small a distance when ψ is not observed.

† VI_5. Rejected on account of large unexplained discordance.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	257	v	July 15.....	H	·64081	296 10 5·22	− 4 52 28·30	+4·899	−7·482	+30·60	+ 7·24
	259	v			·64302	10 3·53	52 27·94	+4·811	−7·489	+30·60	+ 7·24
	261	v			·65208	9 56·63	52 26·45	+4·433	−7·511	+30·60	+ 7·24
	263	v			·65466	9 54·66	52 26·03	+4·327	−7·515	+30·60	+ 7·24
VII$_{9}$	267	v	(2)		·66314	9 48·20	52 24·64	+3·963	−7·532	+30·60	+ 7·24
	269	v			·66563	9 46·31	52 24·23	+3·848	−7·536	+30·60	+ 7·24
	271	v			·67399	9 39·94	52 22·86	+3·471	−7·555	+30·60	+ 7·24
	273	v			·67588	9 38·50	52 22·55	+3·387	−7·561	+30·60	+ 7·24
	279	v	July 15.....	E	·74501	296 8 45·85	− 4 52 11·27	+0·004	−7·625	+30·61	+ 7·25
	281	v			·74885	8 42·93	52 10·65	−0·189	−7·626	+30·61	+ 7·25
	283	v			·75266	8 40·03	52 10·02	−0·381	−7·624	+30·61	+ 7·25
VII$_{9}$	285	v	(2)		·75718	8 36·59	52 9·29	−0·609	−7·622	+30·61	+ 7·25
	287	v			·76085	8 33·79	52 8·70	−0·792	−7·620	+30·61	+ 7·25
	289	v			·76571	8 30·09	52 7·91	−1·036	−7·617	+30·61	+ 7·25
	293	u	July 16.....	E	·65721	295 57 10·60	− 4 49 49·64	+4·078	−7·531	+30·74	+ 7·31
	295	u			·66028	57 8·25	49 49·19	+3·940	−7·537	+30·74	+ 7·31
	297	u			·66348	57 5·81	49 48·71	+3·799	−7·543	+30·74	+ 7·31
	298	u			·66655	57 3·47	49 48·26	+3·661	−7·547	+30·74	+ 7·31
VII$_{10}$ *	302	u	(1)		·67513	56 56·93	49 46·99	+3·272	−7·564	+30·74	+ 7·31
	303	u			·67820	56 54·59	49 46·54	+3·130	−7·569	+30·74	+ 7·31
	304	u			·68210	56 51·62	49 45·96	+2·944	−7·576	+30·74	+ 7·31
	306	u			·68515	56 49·29	49 53·10	+2·801	−7·580	+30·74	+ 7·31
	309	u	July 16.....	H	·76260	295 55 50·23	− 4 49 34·15	−1·050	−7·617	+30·75	+ 7·32
	310	u			·76922	55 45·19	49 33·18	−1·383	−7·613	+30·75	+ 7·32
	312	u			·77648	55 39·64	49 32·12	−1·739	−7·606	+30·76	+ 7·32
	313	u			·78226	55 35·24	49 31·28	−2·026	−7·602	+30·76	+ 7·32
	314	u			·78907	55 30·05	49 30·28	−2·354	−7·594	+30·76	+ 7·32
	315	u			·79474	55 25·73	49 29·46	−2·627	−7·586	+30·76	+ 7·32
VII$_{11}$ *	316	u			·80081	55 21·10	49 28·57	−2·915	−7·576	+30·76	+ 7·32
	319	u			·81910	55 7·14	49 25·92	−3·756	−7·544	+30·76	+ 7·33
	320	u			·82496	55 2·67	49 25·07	−4·016	−7·534	+30·76	+ 7·33
	321	u			·83141	54 56·75	49 24·14	−4·295	−7·518	+30·76	+ 7·33
	322	u			·83853	54 52·33	49 23·11	−4·591	−7·502	+30·76	+ 7·33
	323	u			·84614	54 46·52	49 22·00	−4·903	−7·483	+30·76	+ 7·33
	324	u			·85179	54 42·21	49 21·18	−5·129	−7·533	+30·76	+ 7·33

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f'	f'''
		° ′	r	r	″	″	″			
257	v	322 41	34·161	0·031	433·13	432·60	+ 0·53	− 0·606	+ 0·795	− 0·891
259	v	322 31	34·224	0·031	433·93	433·96	− 0·03	− 0·609	+ 0·794	− 0·887
261	v	321 53	34·670	0·029	439·58	439·57	+ 0·01	− 0·617	+ 0·787	− 0·863
263	v	321 43	34·866	0·028	442·07	441·16	+ 0·91	− 0·620	+ 0·785	− 0·858
267	v	321 8	35·151	0·027	445·68	446·49	− 0·81	− 0·628	+ 0·779	− 0·835
269	v	320 58	35·352	0·026	448·23	448·05	+ 0·18	− 0·630	+ 0·777	− 0·828
271	v	320 25	35·809	0·025	454·03	453·36	+ 0·67	− 0·637	+ 0·771	− 0·803
273	v	320 18	35·875	0·024	454·86	454·56	+ 0·30	− 0·639	+ 0·769	− 0·797
279	v	316 11	39·493	0·017	500·83	500·14	+ 0·69	− 0·692	+ 0·722	− 0·551
281	v	315 59	39·632	0·016	502·60	502·73	− 0·13	− 0·695	+ 0·719	− 0·536
283	v	315 47	39·768	0·016	504·32	505·34	− 1·02	− 0·697	+ 0·717	− 0·520
285	v	315 33	40·090	0·016	508·41	508·41	0·00	− 0·700	+ 0·714	− 0·501
287	v	315 21	40·356	0·016	511·78	510·92	+ 0·86	− 0·703	+ 0·711	− 0·487
289	v	315 6	40·530	0·016	513·99	514·25	− 0·26	− 0·706	+ 0·708	− 0·466
293	u	154 53	8·543	0·006	108·34	109·55	− 1·21	+ 0·424	− 0·905	+ 0·853
295	u	155 58	8·455	0·006	107·22	108·12	− 0·90	+ 0·407	− 0·913	+ 0·848
297	u	157 8	8·333	0·006	105·68	106·65	− 0·97	+ 0·389	− 0·921	+ 0·841
298	u	158 16	8·053	0·006	102·12	105·31	− 3·19	+ 0·370	− 0·929	+ 0·836
302	u	161 38	7·765	0·005	98·47	101·76	− 3·29	+ 0·315	− 0·949	+ 0·820
303	u	162 53	7·775	0·005	98·60	100·59	− 1·99	+ 0·294	− 0·956	+ 0·816
304	u	164 32	7·708	0·004	97·75	99·15	− 1·40	+ 0·267	− 0·964	+ 0·809
306	u	165 51	7·591	0·004	96·27	98·10	− 1·83	+ 0·244	− 0·970	+ 0·803
309	u	204 47	7·423	0·004	94·12	92·31	+ 1·81	− 0·419	− 0·908	+ 0·736
310	u	208 1	7·437	0·004	94·29	93·81	+ 0·48	− 0·470	− 0·883	+ 0·737
312	u	211 25	7·469	0·004	94·70	95·81	− 1·11	− 0·521	− 0·853	+ 0·739
313	u	214 2	7·710	0·004	97·76	97·62	+ 0·14	− 0·560	− 0·829	+ 0·743
314	u	216 57	7·760	0·004	98·39	99·99	− 1·60	− 0·601	− 0·799	+ 0·747
315	u	219 17	8·201	0·004	103·98	102·18	+ 1·80	− 0·633	− 0·774	+ 0·753
316	u	221 41	8·105	0·004	102·76	104·68	− 1·92	− 0·665	− 0·747	+ 0·760
319	u	228 10	8·773	0·004	111·23	113·20	− 1·97	− 0·745	− 0·667	+ 0·782
320	u	230 2	8·836	0·006	112·03	116·20	− 3·17	− 0·766	− 0·642	+ 0·790
321	u	232 16	9·663	0·008	122·52	120·43	+ 2·09	− 0·791	− 0·612	+ 0·799
322	u	233 59	9·926	0·008	125·85	123·55	+ 2·30	− 0·809	− 0·588	+ 0·811
323	u	236 0	9·974	0·008	126·46	127·90	− 1·44	− 0·829	− 0·559	+ 0·823
324	u	237 24	10·112	0·008	128·21	131·23	− 3·02	− 0·842	− 0·539	+ 0·836

* VII_{10} and VII_{11}. The distances were so small that images could not be crossed through. The objects were observed like a double star by putting one between the other two; but for this the distance was too great. Observations unsatisfactory and useless, and therefore rejected.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	327	t	July 17.....	H	·64952	295 44 33·90	− 4 47 30·94	+4·269	−7·519	+30·89	+ 7·40
	329	t			·65171	44 32·23	47 30·66	+4·173	−7·524	+30·89	+ 7·40
	331	t			·66019	44 25·77	47 29·54	+3·800	−7·541	+30·89	+ 7·40
VII_{12} *	333	t	(1)		·66279	44 23·79	47 29·19	+3·684	−7·546	+30·89	+ 7·40
	335	t			·67243	44 16·42	47 27·93	+3·244	−7·564	+30·89	+ 7·40
	337	t			·67572	44 13·92	47 27·50	+3·090	−7·571	+30·89	+ 7·40
	341†	t	July 17.....	E	·76751	295 43 3·95	− 4 47 15·52	−1·459	−7·610	+30·90	+ 7·41
	343	t			·77185	43 0·64	47 14·95	−1·675	−7·606	+30·90	+ 7·41
	345	t			·77515	42 58·13	47 14·52	−1·839	−7·602	+30·90	+ 7·41
	347	t			·77877	42 55·37	47 14·05	−2·016	−7·600	+30·90	+ 7·41
VII_{13} *	351	t	(1)		·78824	42 48·14	47 12·82	−2·479	−7·588	+30·91	+ 7·42
	353	t			·79157	42 45·61	47 12·39	−2·637	−7·583	+30·91	+ 7·42
	355	t			·79470	42 43·22	47 11·98	−2·787	−7·580	+30·91	+ 7·42
	357	t			·79787	42 40·81	47 11·57	−2·936	−7·575	+30·91	+ 7·42
	361	t	July 18.....	E	·64302	295 31 57·27	− 4 45 28·06	+4·400	−7·509	+31·03	+ 7·50
	363	t			·64820	31 53·33	45 27·46	+4·181	−7·522	+31·03	+ 7·50
	365	t			·65207	31 50·39	45 27·01	+4·014	−7·530	+31·03	+ 7·50
	367	t			·65653	31 47·00	45 26·50	+3·816	−7·537	+31·03	+ 7·50
VII_{14}	369	t	(1)		·66643	31 39·46	45 25·36	+3·369	−7·558	+31·03	+ 7·50
	371	t			·67006	31 36·70	45 24·94	+3·200	−7·563	+31·03	+ 7·50
	373	t			·67326	31 34·28	45 24·57	+3·051	−7·569	+31·03	+ 7·50
	375	t			·67676	31 31·62	45 24·17	+2·888	−7·574	+31·03	+ 7·50
	381	t	July 18.....	H	·77136	295 30 19·70	− 4 45 13·34	−1·815	−7·600	+31·04	+ 7·50
	383	t			·77468	30 17·18	45 12·96	−1·978	−7·598	+31·04	+ 7·50
	385	t			·78449	30 9·72	45 11·84	−2·456	−7·586	+31·04	+ 7·50
	387	t			·78698	30 7·83	45 11·57	−2·574	−7·581	+31·04	+ 7·50
	389	t			·79601	30 0·96	45 10·55	−3·002	−7·570	+31·04	+ 7·50
VII_{15}	391	t	(2)		·79898	29 58·71	45 10·22	−3·142	−7·564	+31·04	+ 7·50
	393	t			·81077	29 49·75	45 8·88	−3·679	−7·542	+31·04	+ 7·50
	395	t			·81331	29 47·81	45 8·60	−3·794	−7·537	+31·04	+ 7·50
	397	t			·82267	29 40·71	45 7·54	−4·205	−7·519	+31·04	+ 7·50
	399	t			·82528	29 38·72	45 7·24	−4·317	−7·513	+31·04	+ 7·50

† VII_{12} No. 341. Seconds of Apparent Declination inadvertently used as 23″·63 in discussion with Ephemeris I. instead of 23″·13. Error corrected in discussion with Ephemeris II.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O C.	f'	f''	f'''
		° ′	r	r	″	″	″			
327	t	233 43	11·591	0·004	146·96	147·96	− 1·00	− 0·806	− 0·592	+ 0·102
329	t	234 12	11·755	0·004	149·04	149·22	− 0·18	− 0·811	− 0·585	+ 0·103
331	t	236 1	12·195	0·004	154·62	154·18	+ 0·44	− 0·829	− 0·559	+ 0·107
333	t	236 33	12·305	0·004	156·02	155·73	+ 0·29	− 0·834	− 0·551	+ 0·111
335	t	238 26	12·606	0·004	159·83	161·62	− 1·79	− 0·852	− 0·523	+ 0·120
337	t	239 3	12·808	0·004	162·39	163·66	− 1·27	− 0·858	− 0·514	+ 0·124
341	t	251 16	17·898	0·006	226·98	226·62	+ 0·36	− 0·947	− 0·321	+ 0·382
343	t	251 49	18·033	0·006	228·69	229·61	− 0·92	− 0·950	− 0·312	+ 0·396
345	t	252 7	18·230	0·006	231·19	232·01	− 0·82	− 0·952	− 0·307	+ 0·408
347	t	252 27	18·462	0·006	234·13	234·66	− 0·53	− 0·953	− 0·302	+ 0·422
351	t	253 16	19·011	0·008	241·09	241·63	− 0·54	− 0·958	− 0·288	+ 0·456
353	t	253 33	19·195	0·008	243·42	244·07	− 0·65	− 0·959	− 0·283	+ 0·467
355	t	253 49	19·392	0·008	245·92	246·38	− 0·46	− 0·960	− 0·279	+ 0·478
357	t	254 4	19·606	0·008	248·64	248·72	− 0·08	− 0·962	− 0·275	+ 0·490
361	t	272 19	68·908	0·030	873·86	874·00	− 0·14	− 0·999	+ 0·040	− 0·468
363	t	272 20	69·250	0·028	878·20	878·17	+ 0·03	− 0·999	+ 0·041	− 0·447
365	t	272 21	69·465	0·028	880·93	881·28	− 0·35	− 0·999	+ 0·041	− 0·430
367	t	272 23	69·752	0·027	884·57	884·87	− 0·30	− 0·999	+ 0·042	− 0·412
369	t	272 26	70·449	0·026	893·41	892·87	+ 0·54	− 0·999	+ 0·042	− 0·367
371	t	272 27	70·637	0·024	895·79	895·81	− 0·02	− 0·999	+ 0·043	− 0·351
373	t	272 28	70·820	0·024	898·11	898·38	− 0·27	− 0·999	+ 0·043	− 0·336
375	t	272 29	71·073	0·024	901·32	901·20	+ 0·12	− 0·999	+ 0·043	− 0·321
381	t	272 55	77·187	0·022	978·66	978·01	+ 0·65	− 0·999	+ 0·051	+ 0·142
383	t	272 56	77·375	0·022	981·05	980·69	+ 0·36	− 0·999	+ 0·051	+ 0·158
385	t	272 59	77·956	0·023	988·41	988·65	− 0·24	− 0·999	+ 0·052	+ 0·206
387	t	272 59	78·079	0·024	989·97	990·66	− 0·69	− 0·999	+ 0·052	+ 0·217
389	t	273 1	78·815	0·025	999·30	997·98	+ 1·32	− 0·999	+ 0·053	+ 0·259
391	t	273 2	78·976	0·025	1001·34	1000·37	+ 0·97	− 0·999	+ 0·053	+ 0·272
393	t	273 5	79·613	0·028	1009·42	1009·90	− 0·48	− 0·999	+ 0·054	+ 0·325
395	t	273 6	79·868	0·028	1012·65	1011·96	+ 0·69	− 0·999	+ 0·054	+ 0·336
397	t	273 8	80·422	0·030	1019·68	1019·50	+ 0·18	− 0·999	+ 0·055	+ 0·378
399	t	273 9	80·567	0·031	1021·52	1021·60	− 0·08	− 0·998	+ 0·055	+ 0·389

* VII_{12} and VII_{13}. Rejected because of the uncertainty of the correction for "crossing through" in so small a distance when ψ is not observed.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VIII$_7$	405	q	July 20.....	E	·66395	295 6 27·72	− 4 42 7·20	+3·176	−7·554	+31·29	+ 7·62
	407	q			·66685	6 25·54	42 6·96	+3·040	−7·559	+31·29	+ 7·62
	409	q	( )		·66888	6 24·02	42 6·79	+2·944	−7·561	+31·29	+ 7·62
	411	q			·67135	6 22·16	42 6·58	+2·827	−7·565	+31·29	+ 7·62
	413	q			·67802	6 17·14	42 6·03	+2·511	−7·573	+31·29	+ 7·62
	415	q			·68072	6 15·11	42 5·81	+2·382	−7·577	+31·29	+ 7·62
VIII$_8$	419	q	July 21.....	H	·62350	294 54 28·84	− 4 40 54·83	+4·792	−7·471	+31·40	+ 7·73
	421	q			·63142	54 22·94	40 54·29	+4·466	−7·490	+31·40	+ 7·73
	423	q			·63862	54 17·57	40 53·81	+4·161	−7·506	+31·40	+ 7·73
	425	q	(2)		·64559	54 12·37	40 53·33	+3·853	−7·519	+31·40	+ 7·73
	427	q			·65379	54 6·26	40 52·80	+3·487	−7·535	+31·40	+ 7·73
	429	q			·66048	54 1·27	40 52·34	+3·184	−7·546	+31·40	+ 7·73
	431	q			·66721	53 56·25	40 51·89	+2·866	−7·557	+31·40	+ 7·73
	433	q			·67386	53 51·29	40 51·44	+2·549	−7·565	+31·40	+ 7·73
VIII$_9$	439	q	July 21.....	E	·78004	294 52 32·17	− 4 40 44·42	−2·715	−7·562	+31·41	+ 7·73
	441	q			·78347	52 29·62	40 44·20	−2·877	−7·556	+31·41	+ 7·73
	443	q			·78656	52 27·31	40 43·99	−3·021	−7·552	+31·41	+ 7·73
	445	q	(2)		·78954	52 25·09	40 43·80	−3·161	−7·547	+31·41	+ 7·73
	447	q			·79590	52 20·36	40 43·39	−3·453	−7·536	+31·41	+ 7·73
	449	q			·79921	52 17·89	40 43·17	−3·603	−7·529	+31·41	+ 7·73
	451	q			·80245	52 15·48	40 42·96	−3·751	−7·521	+31·41	+ 7·73
	453	q			·80579	52 12·99	40 42·74	−3·896	−7·516	+31·41	+ 7·73
VIII$_{10}$	459	q	July 22.....	E	·63047	294 42 1·57	− 4 39 54·60	+4·363	−7·487	+31·49	+ 7·81
	461	q			·63435	41 58·70	39 54·40	+4·200	−7·496	+31·49	+ 7·81
	463	q			·63842	41 55·70	39 54·19	+4·023	−7·503	+31·49	+ 7·81
	465	q			·64169	41 53·29	39 54·02	+3·877	−7·509	+31·49	+ 7·81
	467	q	(2)		·65438	41 43·92	39 53·36	+3·310	−7·534	+31·49	+ 7·81
	469	q			·65737	41 41·72	39 53·21	+3·172	−7·539	+31·49	+ 7·81
	471	q			·66050	41 39·41	39 53·05	+3·026	−7·544	+31·49	+ 7·81
	473	q			·66409	41 36·76	39 52·87	+2·856	−7·549	+31·49	+ 7·81
IX$_6$	479	p	July 23.....	H	·62438	294 29 52·61	− 4 39 10·76	+4·478	−7·473	+31·56	+ 7·83
	481	q			·63427	29 45·40	39 10·41	+4·058	−7·494	+31·59	+ 7·91
	483	q			·64392	29 38·37	39 10·06	+3·632	−7·511	+31·59	+ 7·91
	485	p	(2)		·65893	29 27·45	39 9·52	+2·941	−7·537	+31·56	+ 7·83
	487	p			·66834	29 20·60	39 9·18	+2·496	−7·549	+31·56	+ 7·83
	489	q			·67704	29 14·26	39 8·87	+2·078	−7·561	+31·59	+ 7·91

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	″	″	″	″	″			
405	q	71 36	74·928	0·020	950·21	950·18	+ 0·03	+ 0·949	+ 0·316	+ 0·062
407	q	71 32	74·841	0·020	949·10	948·06	+ 1·04	+ 0·949	+ 0·317	+ 0·048
409	q	71 30	74·656	0·020	946·76	946·58	+ 0·18	+ 0·948	+ 0·317	+ 0·038
411	q	71 27	74·505	0·020	944·84	944·78	+ 0·06	+ 0·948	+ 0·318	+ 0·026
413	q	71 19	74·153	0·020	940·38	939·91	+ 0·47	+ 0·947	+ 0·320	— 0·005
415	q	71 16	73·850	0·020	936·54	937·94	— 1·40	+ 0·947	+ 0·321	— 0·018
419	q	26 38	32·854	0·014	416·56	416·50	+ 0·06	+ 0·448	+ 0·894	— 0·454
421	q	25 50	32·683	0·014	414·39	414·23	+ 0·16	+ 0·436	+ 0·900	— 0·480
423	q	25 5	32·533	0·014	412·49	412·21	+ 0·28	+ 0·424	+ 0·906	— 0·504
425	q	24 22	32·326	0·014	409·86	410·34	— 0·48	+ 0·413	+ 0·911	— 0·526
427	q	23 31	32·229	0·016	408·63	408·19	+ 0·44	+ 0·399	+ 0·917	— 0·552
429	q	22 48	32·070	0·016	406·62	406·52	+ 0·10	+ 0·388	+ 0·922	— 0·573
431	q	22 5	31·943	0·016	405·01	404·90	+ 0·11	+ 0·376	+ 0·927	— 0·593
433	q	21 22	31·862	0·016	403·98	403·36	+ 0·62	+ 0·364	+ 0·931	— 0·612
439	q	9 20	30·579	0·020	387·79	387·78	+ 0·01	+ 0·162	+ 0·987	— 0·790
441	q	8 56	30·571	0·020	387·69	387·57	+ 0·12	+ 0·155	+ 0·988	— 0·791
443	q	8 34	30·590	0·020	387·93	387·42	+ 0·51	+ 0·149	+ 0·989	— 0·792
445	q	8 13	30·504	0·020	386·84	387·26	— 0·42	+ 0·143	+ 0·990	— 0·792
447	q	7 29	30·526	0·020	387·12	387·00	+ 0·12	+ 0·130	+ 0·991	— 0·792
449	q	7 6	30·457	0·020	386·24	386·89	— 0·65	+ 0·124	+ 0·992	— 0·792
451	q	6 43	30·493	0·021	386·70	386·80	— 0·10	+ 0·117	+ 0·993	— 0·791
453	q	6 19	30·510	0·022	386·92	386·72	+ 0·20	+ 0·110	+ 0·994	— 0·790
459	q	307 45	55·715	0·042	706·56	706·43	+ 0·13	— 0·791	+ 0·612	— 0·802
461	q	307 37	55·895	0·040	708·84	708·93	— 0·09	— 0·792	+ 0·610	— 0·789
463	q	307 28	56·183	0·038	712·49	711·57	+ 0·92	— 0·794	+ 0·608	— 0·774
465	q	307 21	56·259	0·038	713·45	713·69	— 0·24	— 0·795	+ 0·607	— 0·764
467	q	306 55	56·976	0·034	722·55	721·97	+ 0·58	— 0·800	+ 0·601	— 0·717
469	q	306 49	57·114	0·033	724·30	723·92	+ 0·38	— 0·801	+ 0·599	— 0·705
471	q	306 43	57·218	0·032	725·62	725·97	— 0·35	— 0·802	+ 0·598	— 0·693
473	q	306 35	57·433	0·032	728·34	728·33	+ 0·01	— 0·803	+ 0·596	— 0·679
479	p	102 18	146·891	0·077	1862·45	1862·29	+ 0·16	+ 0·977	— 0·213	+ 0·595
481	q	290 14	108·731	0·060	1378·61	1377·70	+ 0·91	— 0·938	+ 0·346	— 0·639
483	q	290 9	109·239	0·055	1385·05	1384·80	+ 0·25	— 0·939	+ 0·345	— 0·599
485	p	102 26	144·739	0·055	1835·16	1836·05	— 0·89	+ 0·977	— 0·215	+ 0·448
487	p	102 29	144·212	0·052	1828·48	1828·88	— 0·40	+ 0·976	— 0·216	+ 0·406
489	q	289 50	111·220	0·042	1410·17	1409·22	+ 0·95	— 0·941	+ 0·339	— 0·451

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Set.	Rotation No	Star	Date. — Definition.	Observer.	Fraction of Day. B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	491	r	July 23.....	E	·77678	294 28 1·69	− 4 39 5·40	−2·866	−7·539	+31·54	+ 7·98
	492	n			·78408	27 56·39	39 5·15	−3·206	−7·527	+31·67	+ 7·77
	493	n			·78837	27 53·27	39 5·01	−3·402	−7·520	+31·67	+ 7·77
	494	r			·80224	27 43·18	39 4·54	−4·024	−7·494	+31·55	+ 7·98
IX_7	495	r	(2)		·80894	27 38·31	39 4·31	−4·312	−7·480	+31·55	+ 7·98
	496	n			·81221	27 35·94	39 4·20	−4·448	−7·471	+31·68	+ 7·77
	497	n			·81653	27 32·80	39 4·05	−4·630	−7·463	+31·68	+ 7·77
	498	r			·82038	27 30·00	39 3·93	−4·784	−7·453	+31·55	+ 7·99
	499	p	July 24.....	E	·62045	294 17 52·23	− 4 38 42·18	+4·498	−7·461	+31·65	+ 7·93
	500	q			·62514	17 48·87	38 42·08	+4·302	−7·473	+31·69	+ 8·00
	501	q			·62893	17 46·14	38 42·00	+4·142	−7·480	+31·69	+ 8·00
	502	p			·63333	17 42·99	38 41·91	+3·951	−7·489	+31·65	+ 7·93
IX_8	503	p	(2)		·64224	17 36·59	38 41·72	+3·555	−7·504	+31·65	+ 7·93
	504	q			·64767	17 32·70	38 41·61	+3·308	−7·513	+31·69	+ 8·00
	505	q			·65341	17 28·59	38 41·50	+3·042	−7·523	+31·69	+ 8·00
	506	p			·65937	17 24·31	38 41·38	+2·762	−7·531	+31·65	+ 7·93
	507	r	July 24.....	H	·78409	294 15 54·95	− 4 38 38·93	−3·354	−7·512	+31·64	+ 8·08
	508	n			·79856	15 44·60	38 38·67	−4·005	−7·484	+31·76	+ 7·85
IX_9	509	n	(2)		·81089	15 35·79	38 38·45	−4·526	−7·458	+31·76	+ 7·85
	510	r			·82661	15 24·55	38 38·17	−5·156	−7·418	+31·65	+ 8·08
	511	r			·83210	15 20·62	38 38·07	−5·363	−7·403	+31·65	+ 8·08
	512	n			·84359	15 12·41	38 37·86	−5·775	−7·371	+31·77	+ 7·86
	515	p	July 25.....	H	·61448	294 6 4·93	− 4 38 28·78	+4·604	−7·446	+31·73	+ 8·02
	517	p			·61688	6 3·23	38 28·77	+4·503	−7·449	+31·73	+ 8·02
	519	p			·62517	5 57·39	38 28·72	+4·154	−7·468	+31·73	+ 8·02
	521	p			·62725	5 55·92	38 28·71	+4·066	−7·471	+31·73	+ 8·02
	523	p			·63751	5 48·69	38 28·64	+3·611	−7·490	+31·73	+ 8·02
X_7	525	p	(2)		·64026	5 46·75	38 28·63	+3·489	−7·495	+31·73	+ 8·02
	527	p			·64991	5 39·95	38 28·57	+3·047	−7·512	+31·73	+ 8·02
	529	p			·65186	5 38·57	38 28·56	+2·956	−7·514	+31·73	+ 8·02
	531	p			·66025	5 32·66	38 28·52	+2·560	−7·526	+31·73	+ 8·02
	533	p			·66211	5 31·35	38 28·51	+2·472	−7·527	+31·73	+ 8·02
	539	p	July 25.....	E	·75928	294 4 22·95	− 4 38 28·07	−2·339	−7·530	+31·74	+ 8·03
	541	p			·76425	4 19·46	38 28·05	−2·576	−7·524	+31·74	+ 8·03
	543	p			·77003	4 15·38	38 28·03	−2·849	−7·516	+31·74	+ 8·03
X_8	545	p	(2)		·77587	4 11·29	38 28·01	−3·124	−7·508	+31·74	+ 8·03
	547	p			·78125	4 7·51	38 27·99	−3·367	−7·499	+31·74	+ 8·03
	549	p			·78577	4 4·33	38 27·98	−3·570	−7·489	+31·74	+ 8·03

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
491	r	227 30	303·462	0·172	3848·38	3848·49	− 0·11	− 0·737	− 0·676	+ 0·721
492	n	38 47	381·048	0·255	4832·30	4831·65	+ 0·65	+ 0·626	+ 0·780	− 0·787
493	n	38 45	380·891	0·264	4830·31	4829·70	+ 0·61	+ 0·626	+ 0·780	− 0·799
494	r	227 42	304·522	0·211	3861·83	3862·36	− 0·53	− 0·740	− 0·673	+ 0·801
495	r	227 45	304·815	0·228	3865·54	3866·01	− 0·47	− 0·740	− 0·672	+ 0·821
496	n	38 34	380·139	0·327	4820·77	4818·93	+ 1·84	+ 0·623	+ 0·782	− 0·860
497	n	38 32	379·842	0·341	4817·00	4817·00	0·00	+ 0·623	+ 0·782	− 0·871
498	r	227 51	305·311	0·257	3871·83	3872·22	− 0·39	− 0·741	− 0·671	+ 0·853
499	p	108 29	91·536	0·055	1160·82	1161·34	− 0·52	+ 0·948	− 0·317	+ 0·661
500	q	284 7	163·176	0·088	2069·33	2069·15	+ 0·18	− 0·970	+ 0·244	− 0·598
501	q	284 6	163·420	0·085	2072·43	2071·96	+ 0·47	− 0·970	+ 0·244	− 0·583
502	p	108 38	90·840	0·048	1152·00	1152·02	− 0·02	+ 0·948	− 0·320	+ 0·613
503	p	108 44	90·259	0·044	1144·63	1145·55	− 0·92	+ 0·947	− 0·321	+ 0·577
504	q	284 1	164·556	0·071	2086·83	2085·85	+ 0·98	− 0·970	+ 0·242	− 0·502
505	q	283 59	164·804	0·068	2089·98	2090·11	− 0·13	− 0·970	+ 0·242	− 0·476
506	p	108 55	89·302	0·038	1132·49	1133·11	− 0·62	+ 0·946	− 0·324	+ 0·504
507	r	234 9	346·669	0·201	4395·45	4394·97	− 0·48	− 0·811	− 0·586	+ 0·712
508	n	31 11	349·824	0·260	4435·45	4434·13	+ 1·32	+ 0·518	+ 0·856	− 0·847
509	n	31 5	349·492	0·314	4431·24	4429·53	+ 1·71	+ 0·516	+ 0·856	− 0·872
510	r	234 24	348·731	0·317	4421·59	4420·55	+ 1·04	− 0·813	− 0·582	+ 0·850
511	r	234 26	348·944	0·341	4424·30	4423·83	+ 0·47	− 0·813	− 0·582	+ 0·866
512	n	30 48	348·498	0·457	4418·64	4417·49	+ 1·15	+ 0·512	+ 0·859	− 0·928
515	p	131 50	41·903	0·035	531·29	532·07	− 0·78	+ 0·745	− 0·667	+ 0·839
517	p	131 58	41·757	0·033	529·44	530·73	− 1·29	+ 0·744	− 0·669	+ 0·832
519	p	132 25	41·439	0·031	525·41	526·14	− 0·73	+ 0·738	− 0·675	+ 0·809
521	p	132 31	41·360	0·031	524·41	525·00	− 0·59	+ 0·737	− 0·676	+ 0·804
523	p	133 5	40·896	0·027	518·52	519·33	− 0·81	+ 0·730	− 0·683	+ 0·775
525	p	133 15	40·742	0·027	516·57	517·83	− 1·26	+ 0·728	− 0·685	+ 0·767
527	p	133 48	40·388	0·024	512·08	512·57	− 0·49	+ 0·722	− 0·692	+ 0·740
529	p	133 54	40·321	0·024	511·23	511·50	− 0·27	+ 0·721	− 0·693	+ 0·733
531	p	134 24	39·883	0·022	505·68	506·98	− 1·30	+ 0·714	− 0·700	+ 0·709
533	p	134 31	39·856	0·022	505·34	505·97	− 0·63	+ 0·713	− 0·701	+ 0·704
539	p	140 54	35·874	0·014	454·94	456·47	− 1·53	+ 0·631	− 0·776	+ 0·437
541	p	141 16	35·686	0·014	452·56	454·11	− 1·55	+ 0·626	− 0·780	+ 0·426
543	p	141 42	35·458	0·014	449·66	451·39	− 1·73	+ 0·620	− 0·785	+ 0·414
545	p	142 8	35·257	0·014	447·12	448·69	− 1·57	+ 0·614	− 0·789	+ 0·402
547	p	142 32	35·051	0·013	444·50	446·21	− 1·71	+ 0·608	− 0·794	+ 0·392
549	p	142 53	34·920	0·012	442·84	444·15	− 1·31	+ 0·603	− 0·797	+ 0·382

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
XI_{12}	553	k	Aug. 2	E	·68076	292° 40′ 30″·03	− 4° 45′ 23″·89	+0″·277	−7″·423	+32″·02	+ 8″·55
	555	i			·68552	40 27·40	45 24·39	+0·041	−7·424	+32·07	+ 8·50
	557	i			·68986	40 24·99	45 24·84	−0·174	−7·425	+32·07	+ 8·50
	559	k			·69417	40 22·60	45 25·29	−0·386	−7·423	+32·02	+ 8·55
	561	k	(3)		·70197	40 18·28	45 26 11	−0·769	−7·420	+32·02	+ 8·55
	563	i			·70903	40 14·38	45 26·85	−1·117	−7·416	+32·07	+ 8·50
	565	i			·71409	40 11·58	45 27·38	−1·362	−7·413	+32·07	+ 8·50
	567	k			·71890	40 8·92	45 27·89	−1·592	−7·409	+32·02	+ 8·55
XI_{13}	569	h	Aug. 3	E	·71394	292 31 10·55	− 4 47 18·75	+1·499	−7·388	+32·00	+ 8·59
	571	i			·72429	31 5·07	47 19·96	−1·992	−7·379	+32·08	+ 8·57
	573	i	(2)		·72966	31 2·23	47 20·58	−2·249	−7·371	+32·08	+ 8·57
	575	h			·73808	30 57·78	47 21·57	−2·641	−7·362	+32·00	+ 8·59
XI_{14}	577	h	Aug. 3	H	·75071	292 30 51·11	− 4 47 23·06	−3·215	−7·342	+32·00	+ 8·59
	579	i			·76299	30 44·63	47 24·51	−3·754	−7·318	+32·08	+ 8·58
	581	i	(2)		·77485	30 38·38	47 25·91	−4·255	−7·294	+32·08	+ 8·58
	583	h			·78399	30 33·56	47 26·99	−4·624	−7·271	+32·00	+ 8·60
	585*	h			·79388	30 28·35	47 27·16	−5·004	−7·247	+32·00	+ 8·60
XII_{10}	587	g	Aug. 5	E	·60863	292 15 13·98	− 4 51 21·42	+3·229	−7·295	+32·00	+ 8·69
	589	g			·61196	15 12·39	51 21·88	+3·081	−7·301	+32·00	+ 8·69
	591	g			·61482	15 11·01	51 22·28	+2·950	−7·306	+32·00	+ 8·69
	593	g			·61808	15 9·45	51 22·74	+2·804	−7·312	+32·00	+ 8·69
	597	g	(2)		·62721	15 5·07	51 24·00	+2·384	−7·324	+32·00	+ 8·69
	599	g			·63084	15 3·32	51 24·51	+2·217	−7·328	+32·00	+ 8·69
	601	g			·63339	15 2·10	51 24·86	+2·097	−7·332	+32·00	+ 8·69
	603	g			·63634	15 0·68	51 25·27	+1·961	−7·336	+32·00	+ 8·69
XII_{11} †	607	f	Aug. 7	E	·57887	292 0 19·85	− 4 56 15·07	+4·200	−7·199	+31·99	+ 8·77
	609	f			·58453	0 17·43	56 15·97	+3·969	−7·212	+31·99	+ 8·77
	611	f			·58877	0 15·62	56 16·64	+3·794	−7·221	+31·99	+ 8·77
	613	f	(2)		·60023	0 10·73	56 18·46	+3·299	−7·241	+31·99	+ 8·77
	615	f			·60428	0 9·01	56 19·11	+3·125	−7·248	+31·99	+ 8·77
	617	f			·60803	0 7·41	56 19·71	+2·958	−7·253	+31·99	+ 8·77
XII_{12} †	619	f	Aug. 7	E	·73077	291 59 15·32	− 4 56 39·35	−2·832	−7·255	+31·99	+ 8·77
	621	f			·73514	59 13·47	56 40·05	−3·028	−7·247	+31·99	+ 8·77
	623	f			·74276	59 10·26	56 41·28	−3·360	−7·233	+31·99	+ 8·77
	625	f	(2)		·74895	59 7·64	56 42·28	−3·626	−7·222	+31·99	+ 8·77
	627	f			·75122	59 6·69	56 42·64	−3·722	−7·219	+31·99	+ 8·77
	629	f			·75438	59 5·35	56 43·15	−3·859	−7·213	+31·99	+ 8·77

* XI_{14} No. 585. Seconds of Apparent Declination should be 35″·41 instead of 34″·41. The error was discovered on revisal for discussion with Ephemeris II., and is corrected in that discussion.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
553	k	194 34	63·073	0·034	799·87	802·21	— 2·34	— 0·252	— 0·968	+ 0·711
555	i	358 40	72·830	0·042	923·60	922·38	+ 1·22	— 0·023	+ 1·000	— 0·743
557	i	358 30	72·766	0·042	922·79	921·99	+ 0·80	— 0·026	+ 1·000	— 0·743
559	k	195 6	63·408	0·034	804·11	805·63	— 1·52	— 0·260	— 0·965	+ 0·726
561	k	195 24	63·586	0·036	806·37	807·66	— 1·29	— 0·266	— 0·964	+ 0·735
563	i	357 47	72·643	0·042	921·23	920·36	+ 0·87	— 0·039	+ 0·999	— 0·737
565	i	357 35	72·586	0·042	920·51	919·97	+ 0·54	— 0·042	+ 0·999	— 0·734
567	k	196 3	63·914	0·038	810·53	812·11	— 1·58	— 0·276	— 0·961	+ 0·756
569	h	144 20	84·300	0·035	1069·06	1070·15	— 1·09	+ 0·583	— 0·812	+ 0·513
571	i	324 6	78·584	0·032	996·57	995·69	+ 0·88	— 0·586	+ 0·810	— 0·482
573	i	323 56	78·639	0·032	997·27	997·01	+ 0·26	— 0·589	+ 0·808	— 0·463
575	h	145 1	83·847	0·033	1063·31	1064·41	— 1·10	+ 0·573	— 0·819	+ 0·452
577	h	145 23	83·662	0·032	1060·76	1061·49	— 0·73	+ 0·568	— 0·823	+ 0·422
579	i	322 56	79·345	0·029	1006·02	1005·23	+ 0·79	— 0·603	+ 0·798	— 0·359
581	i	322 34	79·548	0·028	1008·60	1008·21	+ 0·39	— 0·608	+ 0·794	— 0·321
583	h	146 21	83·039	0·032	1052·86	1054·09	— 1·23	+ 0·554	— 0·833	+ 0·351
585	h	146 36	82·900	0·032	1051·10	1051·14	— 0·04	+ 0·550	— 0·835	+ 0·331
587	g	152 29	54·468	0·036	690·74	692·42	— 1·68	+ 0·462	— 0·887	+ 0·796
589	g	152 38	54·468	0·036	690·74	692·03	— 1·29	+ 0·460	— 0·888	+ 0·789
591	g	152 45	54·482	0·036	690·92	691·70	— 0·78	+ 0·458	— 0·889	+ 0·785
593	g	152 54	54·437	0·036	690·35	691·34	— 0·99	+ 0·456	— 0·890	+ 0·778
597	g	153 18	54·379	0·034	689·61	690·30	— 0·69	+ 0·449	— 0·893	+ 0·761
599	g	153 28	54·350	0·034	689·24	689·92	— 0·68	+ 0·447	— 0·895	+ 0·755
601	g	153 34	54·302	0·033	688·64	689·63	— 0·99	+ 0·445	— 0·895	+ 0·749
603	g	153 42	54·259	0·032	688·09	689·32	— 1·23	+ 0·443	— 0·896	+ 0·744
607	f	44 12	15·163	0·004	192·29	192·38	— 0·09	+ 0·697	+ 0·717	— 0·224
609	f	43 49	15·003	0·004	190·26	189·89	+ 0·37	+ 0·692	+ 0·722	— 0·247
611	f	43 31	14·862	0·004	188·47	188·03	+ 0·44	+ 0·689	+ 0·725	— 0·263
613	f	42 42	14·463	0·004	183·41	183·02	+ 0·39	+ 0·678	+ 0·735	— 0·309
615	f	42 24	14·328	0·004	181·70	181·26	+ 0·44	+ 0·674	+ 0·738	— 0·325
617	f	42 7	14·219	0·004	180·32	179·63	+ 0·69	+ 0·671	+ 0·742	— 0·340
619	f	28 57	10·269	0·006	130·23	129·80	+ 0·43	+ 0·484	+ 0·875	— 0·771
621	f	28 18	10·183	0·006	129·14	128·22	+ 0·92	+ 0·474	+ 0·880	— 0·781
623	f	27 8	9·926	0·008	125·88	125·51	+ 0·37	+ 0·456	+ 0·890	— 0·796
625	f	26 9	9·771	0·008	123·91	123·33	+ 0·58	+ 0·441	+ 0·898	— 0·807
627	f	25 48	9·696	0·008	122·96	122·55	+ 0·41	+ 0·435	+ 0·900	— 0·811
629	f	25 16	9·650	0·008	122·38	121·47	+ 0·91	+ 0·427	+ 0·904	— 0·816

† XII_{11} and XII_{12} Rejected because of the uncertainty of the correction for "crossing through" in such small distances when ψ is not observed.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day. B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XII_{13}	631	f	Aug. 8	E	·70141	291 52 38·38	− 4 59 19·88	−1·608	−7·261	+31·96	+ 8·82
	633	f	(2)		·70587	52 36·61	59 20·63	−1·818	−7·257	+31·96	+ 8·82
	635	f			·70974	52 35·09	59 21·29	−1·999	−7·254	+31·96	+ 8·82
	637	f			·71384	52 33·47	59 21·99	−2·188	−7·249	+31·96	+ 8·82
XIII_{12}	643	f	Aug. 10.....	E	·61124	291 40 56·33	− 5 5 1·27	+2·366	−7·189	+31·90	+ 8·95
	645	e	( )		·61626	40 54·62	5 2·20	+2·139	−7·195	+31·88	+ 8·83
	647	e			·62017	40 53·29	5 2·94	+1·959	−7·200	+31·88	+ 8·83
	649	f			·62484	40 51·71	5 3·81	+1·745	−7·203	+31·90	+ 8·95
	651	f			·63065	40 49·74	5 4·90	+1·472	−7·209	+31·90	+ 8·95
	653	e			·63383	40 48·67	5 5·49	+1·324	−7·211	+31·87	+ 8·84
	655	e			·63773	40 47·34	5 6·22	+1·139	−7·215	+31·87	+ 8·84
	657	f			·64256	40 45·71	5 7·13	+0·913	−7·219	+31·90	+ 8·96
XIII_{13}	659	f	Aug. 11.....	E	·57487	291 35 42·92	− 5 8 5·61	+3·803	−7·105	+31·86	+ 9·00
	661	e	(2)		·58063	35 41·13	8 6·73	+3·563	−7·114	+31·83	+ 8·89
	663	e			·58399	35 40·08	8 7·39	+3·420	−7·121	+31·83	+ 8·89
	665	f			·58777	35 38·91	8 8·12	+3·261	−7·128	+31·86	+ 9·00
	667	f			·59527	35 36·58	8 9·60	+2·936	−7·141	+31·86	+ 9·00
	669	e			·59876	35 35·50	8 10·28	+2·782	−7·147	+31·83	+ 8·89
	671	e			·60170	35 34·59	8 10·86	+2·651	−7·151	+31·83	+ 8·89
	673	f			·60531	35 33·47	8 11·56	+2·492	−7·156	+31·86	+ 9·00
XIII_{14}	675	e	Aug. 16.....	E	·56840	291 16 15·94	− 5 25 53·08	+3·375	−6·961	+31·52	+ 9·14
	677	e	(2)		·57213	16 15·36	25 53·94	+3·220	−6·969	+31·52	+ 9·14
	679	e			·57507	16 14·90	25 54·61	+3·098	−6·974	+31·52	+ 9·14
	681	e			·57805	18 14·49	25 55·30	+2·973	−6·980	+31·52	+ 9·14
XIII_{15}	687	e	Aug. 16.....	E	·71670	291 15 53·33	− 5 26 27·32	−3·230	−6·962	+31·51	+ 9·15
	689	e	(2)		·72108	15 52·67	26 28·33	−3·414	−6·953	+31·51	+ 9·15
	691	e			·72528	15 52·04	26 29·30	−3·582	−6·946	+31·51	+ 9·15
	693	e			·73014	15 51·31	26 30·42	−3·778	−6·935	+31·51	+ 9·15
XIV_{11}	699	c	Aug. 17.....	E	·58201	291 13 55·59	− 5 29 49·62	+2·665	−6·957	+31·34	+ 9·18
	700	d	(1)		·58471	13 55·26	29 50·26	+2·549	−6·962	+31·49	+ 9·08
	701	d			·58653	13 55·04	29 50·69	+2·472	−6·965	+31·49	+ 9·08
	702	c			·58880	13 54·76	29 51·23	+2·372	−6·967	+31·34	+ 9·18
	703	c			·59156	13 54·42	29 51·88	+2·252	−6·970	+31·34	+ 9·18
	704	d			·59452	13 54·06	29 52·58	+2·121	−6·974	+31·48	+ 9·08
	705	d			·59655	13 53·81	29 53·05	+2·033	−6·977	+31·48	+ 9·08
	706	c			·59928	13 53·48	29 53·70	+1·913	−6·981	+31·33	+ 9·18
	707	c			·60160	13 53·20	29 54·25	+1·808	−6·984	+31·33	+ 9·18
	708	d			·60369	13 52·94	29 54·75	+1·717	−6·985	+31·48	+ 9·08
	709	d			·60536	13 52·74	29 55·14	+1·643	−6·987	+31·48	+ 9·08
	710	c			·60760	13 52·47	29 55·67	+1·540	−6·989	+31·33	+ 9·18

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''.
		° ′	r	r	″	″	″			
631	f	261 56	26·394	0·008	334·72	334·70	+ 0·02	— 0·990	— 0·140	+ 0·261
633	f	261 51	26·546	0·008	336·65	336·76	— 0·11	— 0·990	— 0·142	+ 0·282
635	f	261 47	26·679	0·008	338·33	338·52	— 0·19	— 0·990	— 0·143	+ 0·301
637	f	261 43	26·850	0·009	340·50	340·41	+ 0·09	— 0·990	— 0·144	+ 0·320
643	f	249 17	86·573	0·024	1097·88	1097·70	+ 0·18	— 0·935	— 0·354	+ 0·034
645	e	44 9	103·819	0·037	1316·59	1315·88	+ 0·71	+ 0·697	+ 0·718	— 0·368
647	e	44 8	103·735	0·038	1315·53	1314·30	+ 1·23	+ 0·696	+ 0·718	— 0·381
649	f	249 15	86·964	0·024	1102·84	1103·49	— 0·65	— 0·935	— 0·354	+ 0·092
651	f	249 14	87·178	0·024	1105·56	1105·97	— 0·41	— 0·935	— 0·355	+ 0·119
653	e	44 3	103·190	0·040	1308·61	1308·82	— 0·21	+ 0·695	+ 0·719	— 0·427
655	e	44 1	103·120	0·040	1307·73	1307·24	+ 0·49	+ 0·695	+ 0·719	— 0·440
657	f	249 13	87·682	0·026	1111·95	1111·05	+ 0·90	— 0·935	— 0·355	+ 0·171
659	f	246 49	114·705	0·032	1454·64	1454·85	— 0·21	— 0·919	— 0·394	— 0·068
661	e	38 35	76·665	0·028	972·24	971·64	+ 0·60	+ 0·624	+ 0·782	— 0·335
663	e	38 33	76·575	0·028	971·09	970·38	+ 0·71	+ 0·623	+ 0·782	— 0·345
665	f	246 48	115·139	0·032	1460·15	1460·01	+ 0·14	— 0·919	— 0·394	— 0·017
667	f	246 47	115·333	0·032	1462·61	1463·02	— 0·41	— 0·919	— 0·394	+ 0·012
669	e	38 25	76·106	0·029	965·14	964·86	+ 0·28	+ 0·621	+ 0·784	— 0·389
671	e	38 23	76·031	0·030	964·19	963·76	+ 0·43	+ 0·621	+ 0·784	— 0·397
673	f	246 46	115·692	0·032	1467·16	1467·06	+ 0·10	— 0·919	— 0·394	+ 0·054
675	e	241 1	49·915	0·014	633·00	633·45	— 0·45	— 0·875	— 0·485	+ 0·043
677	e	240 59	49·986	0·014	633·90	634·51	— 0·61	— 0·874	— 0·485	+ 0·058
679	e	240 58	50·065	0·014	634·90	635·34	— 0·44	— 0·874	— 0·485	+ 0·068
681	e	240 56	50·114	0·014	635·53	636·19	— 0·66	— 0·874	— 0·486	+ 0·080
687	e	239 41	53·250	0·032	675·30	675·66	— 0·36	— 0·864	— 0·504	+ 0·074
689	e	239 38	53·402	0·032	677·22	676·89	+ 0·33	— 0·863	— 0·505	+ 0·058
691	e	239 36	53·478	0·033	678·19	678·07	+ 0·12	— 0·863	— 0·506	+ 0·045
693	e	239 34	53·550	0·034	679·10	679·43	— 0·33	— 0·862	— 0·506	+ 0·027
699	c	150 35	114·025	0·076	1446·02	1446·45	— 0·43	+ 0·491	— 0·871	+ 0·737
700	d	346 0	117·630	0·080	1491·74	1490·54	+ 1·20	— 0·242	+ 0·970	— 0·736
701	d	345 59	117·518	0·079	1490·32	1490·19	+ 0·13	— 0·242	+ 0·970	— 0·736
702	c	150 39	114·051	0·074	1446·35	1447·31	— 0·96	+ 0·490	— 0·872	+ 0·724
703	c	150 41	114·074	0·072	1446·64	1447·65	— 1·01	+ 0·490	— 0·872	+ 0·718
704	d	345 55	117·400	0·076	1488·82	1488·67	+ 0·15	— 0·243	+ 0·970	— 0·727
705	d	345 54	117·279	0·076	1487·29	1488·29	— 1·00	— 0·244	+ 0·970	— 0·726
706	c	150 45	114·111	0·070	1447·11	1448·63	— 1·52	+ 0·489	— 0·873	+ 0·702
707	c	150 47	114·150	0·068	1447·60	1448·92	— 1·32	+ 0·488	— 0·873	+ 0·697
708	d	345 50	117·307	0·074	1487·64	1486·92	+ 0·72	— 0·245	+ 0·970	— 0·720
709	d	345 49	117·287	0·074	1487·39	1486·61	+ 0·78	— 0·245	+ 0·970	— 0·718
710	c	150 51	114·227	0·066	1448·58	1449·69	— 1·11	+ 0·487	— 0·873	+ 0·685

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XIV$_{12}$	711	f	Aug. 17.....	E	·70154	291 13 41·23	− 5 30 17·90	−2·698	−6·952	+31·47	+ 9·33
	712	a			·70506	13 40·81	30 18·73	−2·849	−6·947	+31·30	+ 8·96
	713	a			·70808	13 40·46	30 19·45	−2·974	−6·941	+31·30	+ 8·96
	714	f			·71113	13 40·10	30 20·17	−3·104	−6·935	+31·47	+ 9·33
	715	f	(3)		·71371	13 39·79	30 20·78	−3·209	−6·927	+31·47	+ 9·33
	716	a			·71646	13 39·47	30 21·43	−3·302	−6·923	+31·30	+ 8·96
	717	a			·71911	13 39·16	30 22·06	−3·432	−6·918	+31·30	+ 8·96
	718	f			·72286	13 38·71	30 22·95	−3·582	−6·911	+31·47	+ 9·33
XIV$_{13}$	719	c	Aug. 18.....	E	·58310	291 12 9·72	− 5 33 48·75	+2·484	−6·928	+31·25	+ 9·22
	720	d			·58645	12 9·42	33 49·56	+2·340	−6·932	+31·39	+ 9·12
	721	d			·58868	12 9·21	33 50·10	+2·242	−6·936	+31·39	+ 9·12
	722	c			·59163	12 8·95	33 50·81	+2·114	−6·939	+31·24	+ 9·22
	723	c	(1)		·59395	12 8·74	33 51·38	+2·012	−6·942	+31·24	+ 9·22
	724	d			·59668	12 8·51	33 52·04	+1·893	−6·946	+31·39	+ 9·12
	725	d			·59895	12 8·30	33 52·59	+1·792	−6·948	+31·39	+ 9·12
	726	c			·60130	12 8·10	33 53·15	+1·688	−6·951	+31·24	+ 9·22
XIV$_{14}$	727	e	Aug. 21.....	E	·68923	291 10 11·38	− 5 46 40·87	−2·581	−6·814	+31·04	+ 9·37
	728	b			·69220	10 11·43	46 41·63	−2·706	−6·809	+31·04	+ 9·06
	729	b			·69459	10 11·46	46 42·24	−2·804	−6·805	+31·04	+ 9·06
	730	e			·69722	10 11·50	46 42·91	−2·911	−6·799	+31·04	+ 9·37
	731	e	(1)		·69978	10 11·53	46 43·56	−3·016	−6·795	+31·04	+ 9·37
	732	b			·70262	10 11·57	46 44·28	−3·131	−6·789	+31·04	+ 9·06
	733	b			·70489	10 11·60	46 44·86	−3·223	−6·784	+31·04	+ 9·06
	734	e			·70789	10 11·65	46 45·63	−3·341	−6·777	+31·04	+ 9·37
XV$_{8}$	735	d	Aug. 22.....	E	·70202	291 10 42·32	− 5 51 0·78	−3·197	−6·748	+30·97	+ 9·28
	737	d			·70677	10 42·54	51 2·01	−3·384	−6·738	+30·97	+ 9·28
	739	d	(2)		·71085	10 42·74	51 3·06	−3·541	−6·729	+30·97	+ 9·28
	741	d			·71438	10 42·91	51 3·97	−3·675	−6·721	+30·97	+ 9·28
	743	d			·71716	10 43·04	51 4·69	−3·783	−6·713	+30·97	+ 9·28

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f′	f″	f‴
		° ′	r	r	″	″	″			
711	f	234 23	257·921	0·143	3270·85	3271·27	− 0·42	− 0·813	− 0·582	+ 0·623
712	a	62 34	274·815	0·146	3485·09	3485·36	− 0·27	+ 0·888	+ 0·461	− 0·572
713	a	62 34	274·819	0·151	3485·14	3484·62	+ 0·52	+ 0·888	+ 0·461	− 0·583
714	f	234 22	258·167	0·155	3273·97	3273·83	+ 0·14	− 0·813	− 0·583	+ 0·655
715	f	234 22	258·198	0·159	3274·36	3274·52	− 0·16	− 0·813	− 0·583	+ 0·663
716	a	62 35	274·612	0·163	3482·52	3482·53	− 0·01	+ 0·888	+ 0·460	− 0·609
717	a	62 35	274·530	0·167	3481·48	3481·87	− 0·39	+ 0·888	+ 0·460	− 0·621
718	f	234 21	258·417	0·174	3277·14	3276·94	+ 0·20	− 0·813	− 0·583	+ 0·692
719	c	158 1	127·416	0·084	1615·84	1616·52	− 0·68	+ 0·374	− 0·927	+ 0·734
720	d	338 53	102·008	0·068	1293·62	1293·81	− 0·19	− 0·360	+ 0·933	− 0·730
721	d	338 52	102·017	0·067	1293·74	1293·41	+ 0·33	− 0·361	+ 0·933	− 0·729
722	c	158 5	127·503	0·082	1616·94	1618·02	− 1·08	+ 0·373	− 0·928	+ 0·722
723	c	158 6	127·529	0·080	1617·27	1618·44	− 1·17	+ 0·373	− 0·928	+ 0·719
724	d	338 47	101·902	0·064	1292·28	1291·97	+ 0·31	− 0·362	+ 0·932	− 0·716
725	d	338 46	101·874	0·064	1291·92	1291·57	+ 0·35	− 0·362	+ 0·932	− 0·712
726	c	158 10	127·678	0·078	1619·16	1619·73	− 0·57	+ 0·372	− 0·928	+ 0·707
727	e	210 41	142·515	0·093	1807·32	1807·71	− 0·39	− 0·510	− 0·860	+ 0·717
728	b	32 48	208·518	0·143	2644·34	2644·51	− 0·17	+ 0·542	+ 0·841	− 0·719
729	b	32 48	208·466	0·145	2643·68	2643·96	− 0·28	+ 0·542	+ 0·841	− 0·724
730	e	210 39	142·619	0·099	1808·64	1809·56	− 0·92	− 0·510	− 0·860	+ 0·732
731	e	210 39	142·642	0·101	1808·93	1810·16	− 1·23	− 0·510	− 0·860	+ 0·738
732	b	32 49	208·388	0·154	2642·69	2642·15	+ 0·54	+ 0·542	+ 0·840	− 0·739
733	b	32 49	208·358	0·157	2642·31	2641·63	+ 0·68	+ 0·542	+ 0·840	− 0·744
734	e	210 37	142·812	0·107	1811·08	1812·03	− 0·95	− 0·509	− 0·861	+ 0·753
735	d	287 29	46·122	0·013	584·90	584·81	+ 0·09	− 0·954	+ 0·300	+ 0·100
737	d	287 22	46·020	0·014	583·61	584·41	− 0·80	− 0·954	+ 0·298	+ 0·120
739	d	287 17	46·016	0·014	583·56	584·06	− 0·50	− 0·955	+ 0·297	+ 0·136
741	d	287 12	46·060	0·014	584·11	583·77	+ 0·34	− 0·955	+ 0·296	+ 0·151
743	d	287 8	45·989	0·014	583·21	583·53	[− 0·32]	− 0·956	+ 0·295	+ 0·161

No. 743. Rejected.

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TABLE C.—LEIPZIG DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′	° ′ ″	″	″	″	″
II₄	12	θ	June 17.....	P	·46309	300 34 53·59	− 7 47 3·28	+4·518	−7·887	+23·16	+ 4·32
	13	μ			·47675	34 50·50	46 55·87	+4·158	−7·937	+22·99	+ 4·84
	14	μ	(2)		·48752	34 48·05	46 50·04	+3·854	−7·975	+22·99	+ 4·84
	15	θ			·50002	34 45·21	46 43·26	+3·476	−8·013	+23·17	+ 4·33
	16	θ			·51503	34 41·80	46 35·13	+2·996	−8·057	+23·17	+ 4·33
II₅	17	θ	June 18	P	·47903	300 30 48·05	− 7 37 56·73	+4·037	−7·997	+23·50	+ 4·45
	18	μ			·49151	30 44·84	37 50·08	+3·671	−8·036	+23·35	+ 4·97
	19	μ			·50199	30 42·14	37 44·50	+3·342	−8·066	+23·35	+ 4·97
	20	θ			·51258	30 39·41	37 38·85	+2·997	−8·096	+23·51	+ 4·46
	21	θ	(2)		·53032	30 34·83	37 29·40	+2·388	−8·135	+23·52	+ 4·46
	22	μ			·54220	30 31·75	37 23·07	+1·966	−8·157	+23·36	+ 4·97
	23	μ			·55302	30 28·95	37 17·30	+1·572	−8·173	+23·37	+ 4·97
	24	θ			·56500	30 25·84	37 10·91	+1·124	−8·188	+23·53	+ 4·46
III₁₃	31	λ	June 20.....	P	·48340	300 21 12·42	− 7 20 26·29	+3·779	−8·107	+24·03	+ 4·85
	36	λ	(2)		·55954	20 48·20	19 47·15	+1·121	−8·262	+24·05	+ 4·85
III₁₄	39	θ	June 21.....	P	·45733	300 15 49·78	− 7 12 9·99	+4·463	−8·068	+24·48	+ 4·84
	40	λ	(3)		·47452	15 43·83	12 1·30	+3·979	−8·125	+24·35	+ 4·96
III₁₅	41	θ	June 22.....	P	·47223	300 9 44·29	− 7 3 43·22	+3·979	−8·165	+24·80	+ 4·97
	42	λ			·48942	9 37·84	3 34·73	+3·438	−8·214	+24·68	+ 4·97
	43	λ			·50769	9 30·98	3 25·70	+2·820	−8·259	+24·68	+ 4·97
	44	θ			·51615	9 27·80	3 21·52	+2·525	−8·275	+24·81	+ 4·98
	45	θ	(3)		·52331	9 25·11	3 17·98	+2·264	−8·289	+24·81	+ 4·98
	46	λ			·53202	9 21·83	3 13·69	+1·946	−8·304	+24·69	+ 5·10
	47	λ			·54272	9 17·81	3 8·41	+1·546	−8·318	+24·69	+ 5·10
	48	θ			·55218	9 14·24	3 3·75	+1·184	−8·330	+24·82	+ 4·98
III₁₆	56	θ	June 24.....	P	·56386	299 55 39·47	− 6 46 53·99	+0·501	−8·407	+25·45	+ 5·23
	57	θ	(2)		·57395	55 35·10	46 49·24	+0·104	−8·409	+25·45	+ 5·23
III₁₇	61	θ	June 25.....	P	·46853	299 48 57·01	− 6 39 52·92	+3·870	−8·284	+25·72	+ 5·34
	62	θ			·47719	48 53·06	39 48·94	+3·592	−8·308	+25·72	+ 5·34
	65	θ	(1)		·51551	48 35·52	39 31·31	+2·248	−8·392	+25·73	+ 5·35
	66	θ			·52601	48 30·71	39 26·48	+1·858	−8·407	+25·73	+ 5·35

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OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
12	θ	140 56	4108·793	10·798	4119·591	4119·484	+ 0·107	+ 0·630	− 0·776	+ 0·894
13	μ	333 3	5578·891	13·653	5592·544	5591·190	+ 1·354	− 0·453	+ 0·891	− 0·894
14	μ	333 3	5586·623	11·678	5598·301	5597·590	+ 0·711	− 0·453	+ 0·891	− 0·884
15	θ	140 51	4092·256	6·193	4098·449	4098·160	+ 0·289	+ 0·631	− 0·776	+ 0·840
16	θ	140 49	4083·692	5·225	4088·917	4089·463	− 0·546	+ 0·632	− 0·775	+ 0·813
17	θ	138 35	3538·368	6·610	3544·978	3545·000	− 0·022	+ 0·662	− 0·749	+ 0·864
18	μ	333 19	6177·889	11·695	6189·584	6188·310	+ 1·274	− 0·449	+ 0·894	− 0·882
19	μ	333 19	6184·951	10·371	6195·322	6194·619	+ 0·703	− 0·449	+ 0·894	− 0·870
20	θ	138 21	3520·975	4·332	3525·307	3525·339	− 0·032	+ 0·665	− 0·747	+ 0·803
21	θ	138 18	3510·853	3·634	3514·487	3514·885	− 0·398	+ 0·665	− 0·747	+ 0·766
22	μ	333 19	6212·786	7·321	6220·107	6218·924	+ 1·183	− 0·449	+ 0·894	− 0·818
23	μ	333 18	6219·801	6·845	6226·646	6225·499	+ 1·147	− 0·449	+ 0·893	− 0·800
24	θ	138 14	3491·598	2·783	3494·381	3494·352	+ 0·029	+ 0·666	− 0·746	+ 0·685
31	λ	269 42	1224·440	0·649	1225·089	1224·761	+ 0·328	− 1·000	− 0·005	− 0·371
36	λ	271 30	1252·020	0·366	1252·386	1251·867	+ 0·519	− 1·000	+ 0·026	− 0·132
39	θ	127 6	1828·917	3·648	1832·565	1832·728	− 0·163	+ 0·798	− 0·603	+ 0·840
40	λ	287 49	1627·708	1·694	1629·402	1629·172	+ 0·230	− 0·952	+ 0·306	− 0·625
41	θ	118 36	1249·548	1·602	1251·150	1251·107	+ 0·043	+ 0·878	− 0·479	+ 0·738
42	λ	297 41	2161·301	2·197	2163·498	2162·908	+ 0·590	− 0·885	+ 0·465	− 0·684
43	λ	297 48	2172·763	1·775	2174·538	2173·662	+ 0·876	− 0·885	+ 0·466	− 0·633
44	θ	118 7	1223·958	0·897	1224·855	1225·184	− 0·329	+ 0·882	− 0·471	+ 0·611
45	θ	118 2	1219·930	0·830	1220·760	1220·931	− 0·171	+ 0·883	− 0·470	+ 0·588
46	λ	297 58	2186·749	1·397	2188·146	2188·002	+ 0·144	− 0·883	+ 0·469	− 0·561
47	λ	298 2	2193·628	1·274	2194·902	2194·344	+ 0·558	− 0·883	+ 0·470	− 0·527
48	θ	117 42	1202·900	0·630	1203·530	1203·808	− 0·278	+ 0·885	− 0·465	+ 0·491
56	θ	31 59	483·197	0·358	483·555	483·077	+ 0·478	+ 0·530	+ 0·848	− 0·687
57	θ	31 12	484·148	0·376	484·524	484·642	− 0·118	+ 0·518	+ 0·855	− 0·714
61	θ	350 23	841·694	1·337	843·031	842·689	+ 0·342	− 0·167	+ 0·986	− 0·830
62	θ	350 9	847·151	1·239	848·390	847·292	+ 1·098	− 0·171	+ 0·985	− 0·880
65	θ	349 8	868·024	0·983	869·007	867·920	+ 1·087	− 0·189	+ 0·982	− 0·866
66	θ	348 51	873·501	0·943	874·444	873·627	+ 0·817	− 0·193	+ 0·981	− 0·861

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
IV_{15}	72	ε	June 26.....	P	·43686	299 41 22·37	− 6 32 32·99	+4·716	−8·228	+26·04	+ 5·19
	73	λ			·44654	41 17·71	32 28·66	+4·454	−8·259	+25·90	+ 5·59
	74	λ			·45752	41 12·41	32 23·74	+4·129	−8·294	+25·91	+ 5·59
	75	ε			·46591	41 8·36	32 19·98	+3·871	−8·318	+26·05	+ 5·19
	76	ε	(1)		·48105	41 1·05	32 13·20	+3·379	−8·358	+26·06	+ 5·19
	77	λ			·49009	40 56·68	32 9·15	+3·067	−8·378	+25·92	+ 5·60
	78	λ			·50335	40 50·27	32 3·21	+2·595	−8·406	+25·92	+ 5·60
	79	ε			·51252	40 45·83	31 59·10	+2·257	−8·423	+26·06	+ 5·20
IV_{16}	80	λ	June 28.....	P	·48380	299 24 3·56	− 6 17 41·16	+3·097	−8·438	+26·51	+ 5·83
	81	γ			·49580	23 57·17	17 36·10	+2·667	−8·463	+26·62	+ 5·35
	82	γ	(3)		·50671	23 51·35	17 31·49	+2·261	−8·481	+26·62	+ 5·35
	83	λ			·51828	23 45·19	17 26·61	+1·821	−8·497	+26·52	+ 5·84
IV_{17}	84	γ	June 29.....	P	·45617	299 15 14·83	− 6 10 56·43	+3·933	−8·407	+26·88	+ 5·47
	85	λ	(2)		·46609	15 9·32	10 52·36	+3·609	−8·432	+26·79	+ 5·95
	86	λ			·47948	15 1·88	10 46·87	+3·152	−8·464	+26·79	+ 5·95
IV_{18}	87	y	June 30	P	·43701	299 5 59·70	− 6 4 20·93	+4·442	−8·389	+27·27	+ 5·59
	88	θ			·44675	5 54·08	4 17·07	+4·148	−8·417	+27·15	+ 5·95
	89	θ			·45781	5 47·70	4 12·69	+3·793	−8·446	+27·15	+ 5·95
	90	y			·46919	5 41·14	4 8·18	+3·414	−8·473	+27·27	+ 5·59
	91	y	(3)		·48802	5 30·26	4 0·72	+2·742	−8·512	+27·28	+ 5·59
	92	θ			·50086	5 22·84	3 55·64	+2·264	−8·534	+27·16	+ 5·96
	93	θ			·51231	5 16·22	3 51·10	+1·823	−8·550	+27·16	+ 5·96
	94	y			·52618	5 8·19	3 45·62	+1·273	−8·566	+27·29	+ 5·60
V_7*	95	z	July 6.....	P	·51865	298 1 34·70	− 5 28 31·92	+0·820	−8·697	+28·78	+ 6·39
	96	z			·53420	1 24·02	28 27·12	+0·179	−8·700	+28·78	+ 6·39
	97	z			·55261	1 11·38	28 21·45	−0·581	−8·700	+28·78	+ 6·39
	98	z	( )		·56310	1 4·17	28 18·22	−1·012	−8·694	+28·79	+ 6·39
	99	z			·57819	0 53·80	28 13·57	−1·621	−8·683	+28·79	+ 6·40
	100	z			·58912	0 46·28	28 10·21	−2·059	−8·671	+28·79	+ 6·40
V_8	104	z	July 7.....	P	·46696	297 50 37·26	− 5 23 46·20	+2·748	−8·661	+28·99	+ 6·50
	105	z	(3)		·48134	50 27·20	23 41·97	+2·197	−8·682	+28·99	+ 6·50
VI_3	113	y	July 9.....	P	·55577	297 25 49·58	− 5 14 5·80	−1·122	−8·735	+29·40	+ 6·69
	114	x	(1)		·56444	25 43·30	14 3·53	−1·477	−8·729	+29·49	+ 6·66
	115	x			·57502	25 35·64	14 0·77	−1·904	−8·719	+29·49	+ 6·66
	116	y			·58328	25 29·66	13 58·61	−2·229	−8·709	+29·41	+ 6·70

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
		°	r	r	"	"	"			
72	ε	154 6	4988·761	11·557	5000·318	5000·115	+ 0·203	+ 0·437	− 0·900	+ 0·946
73	λ	308 32	4599·655	8·911	4608·566	4607·525	+ 1·041	− 0·782	+ 0·623	− 0·861
74	λ	308 32	4608·570	7·455	4616·025	4614·948	+ 1·077	− 0·782	+ 0·623	− 0·837
75	ε	154 11	4973·671	7·749	4981·420	4982·041	− 0·621	+ 0·435	− 0·900	+ 0·916
76	ε	154 14	4965·751	6·617	4972·368	4972·592	− 0·224	+ 0·435	− 0·901	+ 0·899
77	λ	308 33	4633·067	4·886	4637·953	4637·033	+ 0·920	− 0·782	+ 0·623	− 0·761
78	λ	308 33	4642·835	4·270	4647·105	4646·061	+ 1·044	− 0·782	+ 0·623	− 0·726
79	ε	154 20	4948·181	5·164	4953·345	4952·903	+ 0·442	+ 0·433	− 0·901	+ 0·856
80	λ	309 2	5960·237	6·317	5966·554	5965·844	+ 0·710	− 0·777	+ 0·630	− 0·771
81	γ	158 51	6487·386	7·153	6494·539	6495·018	− 0·479	+ 0·361	− 0·933	+ 0·885
82	γ	158 53	6481·697	6·664	6488·361	6488·500	− 0·139	+ 0·360	− 0·933	+ 0·872
83	λ	309 2	5986·225	4·552	5990·777	5990·143	+ 0·634	− 0·777	+ 0·630	− 0·676
84	γ	162 8	5935·283	8·924	5944·207	5944·895	− 0·688	+ 0·307	− 0·952	+ 0·921
85	λ	308 53	6627·411	8·385	6635·796	6635·574	+ 0·222	− 0·778	+ 0·628	− 0·808
86	λ	308 53	6639·097	7·141	6646·238	6645·114	+ 1·124	− 0·778	+ 0·628	− 0·774
87	y	131 40	5918·167	9·736	5927·903	5927·861	+ 0·042	+ 0·747	− 0·665	+ 0·888
88	θ	317 36	4010·248	6·758	4017·006	4016·444	+ 0·562	− 0·674	+ 0·738	− 0·899
89	θ	317 34	4018·963	5·848	4024·811	4024·172	+ 0·639	− 0·675	+ 0·738	− 0·877
90	y	131 42	5898·468	6·402	5904·870	5904·885	− 0·015	+ 0·747	− 0·665	+ 0·816
91	y	131 43	5886·368	5·283	5891·651	5891·365	+ 0·286	+ 0·746	− 0·665	+ 0·769
92	θ	317 27	4051·573	3·785	4055·358	4054·406	+ 0·952	− 0·676	+ 0·737	− 0·781
93	θ	317 26	4060·248	3·467	4063·715	4062·480	+ 1·235	− 0·676	+ 0·736	− 0·751
94	y	131 46	5859·994	3·885	5863·879	5863·890	− 0·011	+ 0·746	− 0·666	+ 0·665
95	z	50 21	19·892	0·008	19·900	18·667	+ 1·233	+ 0·770	+ 0·638	− 0·492
96	z	10 32	17·554	0·015	17·569	16·996	+ 0·573	+ 0·183	+ 0·983	− 0·852
97	z	335 26	24·662	0·019	24·681	24·609	+ 0·072	− 0·416	+ 0·909	− 0·767
98	z	325 8	31·378	0·020	31·398	31·224	+ 0·174	− 0·572	+ 0·820	− 0·656
99	z	316 27	43·536	0·023	43·559	41·767	+ 1·792	− 0·689	+ 0·725	− 0·518
100	z	312 30	53·182	0·021	53·203	49·786	+ 3·417	− 0·737	+ 0·676	− 0·435
104	z	294 59	703·502	0·459	703·961	704·334	− 0·373	− 0·906	+ 0·422	− 0·613
105	z	294 56	715·656	0·406	716·062	715·687	+ 0·375	− 0·907	+ 0·422	− 0·564
113	y	239 19	1815·571	0·918	1816·489	1817·196	− 0·707	− 0·860	− 0·510	+ 0·542
114	x	73 47	1220·152	0·483	1220·635	1220·349	+ 0·286	+ 0·960	+ 0·279	− 0·385
115	x	73 33	1212·969	0·527	1213·496	1213·408	+ 0·088	+ 0·959	+ 0·283	− 0·428
116	y	239 51	1829·795	1·148	1830·943	1831·620	− 0·677	− 0·865	− 0·502	+ 0·629

* V_7 Distance too small and results too discordant for use. Was measured as a double star for which s too great. Rejected.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax. α	Parallax. δ	Star Correction. α	Star Correction. δ
						° ′ ″	° ′ ″	″	″	″	″
VI_4	117	w	July 11.....	P	·39030	297 3 25·74	− 5 6 32·40	+4·901	−8·571	+29·82	+ 6·82
	118	w	(2)		·42714	2 58·47	6 23·85	+3·743	−8·661	+29·83	+ 6·83
	119	x			·43575	2 52·09	6 21·85	+3·439	−8·677	+29·75	+ 6·87
IX_5	128	p	July 22.....	P	·38691	294 20 40·13	− 4 38 47·52	+3·655	−8·651	+31·63	+ 7·91
	130	q	(2)		·40875	20 24·41	38 46·99	+2·855	−8·688	+31·67	+ 7·98
XI_5	132	n	July 29.....	P	·39773	293 23 24·96	− 4 39 51·73	+2·629	−8·613	+32·06	+ 8·22
	133	l	(1)		·40497	23 20·29	39 52·09	+2·353	−8·623	+31·82	+ 8·29
	134	l			·41265	23 15·34	39 52·46	+2·049	−8·631	+31·82	+ 8·29
	135	n			·42236	23 9·09	39 52·94	+1·658	−8·641	+32·06	+ 8·22
XI_9*	136	o	July 30.....	P	·49542	293 11 48·66	− 4 40 53·80	−1·467	−8·621	+31·98	+ 8·43
	137	m	(1)		·50637	11 41·83	40 54·50	−1·906	−8·613	+31·99	+ 8·31
	138	m			·51722	11 35·07	40 55·19	−2·330	−8·599	+31·99	+ 8·31
	139	o			·52664	11 29·20	40 55·79	−2·689	−8·587	+31·98	+ 8·43
	140	o			·53933	11 21·30	40 56·61	−3·162	−8·568	+31·98	+ 8·43
	141	m			·55239	11 13·16	40 57·46	−3·625	−8·545	+31·99	+ 8·31
	142	m			·56981	11 2·32	40 58·59	−4·204	−8·509	+31·99	+ 8·31
	143	o			·57968	10 56·18	40 59·23	−4·508	−8·488	+31·98	+ 8·43
XI_{10}	146	m	July 31.....	P	·37201	293 2 49·81	− 4 41 54·98	+3·325	−8·540	+32·02	+ 8·37
	149	m	(:)		·40483	2 29·95	41 57·48	+2·095	−8·587	+32·02	+ 8·38
	157	m			·53703	1 10·16	42 7·64	−3·185	−8·544	+32·02	+ 8·39
XI_{11}	158	m	Aug. 1.....	P	·36347	292 52 59·90	− 4 43 16·35	+3·503	−8·507	+32·05	+ 8·45
	159	k	(2)		·37661	52 52·23	43 17·51	+3·035	−8·529	+32·00	+ 8·46
	160	k			·38633	52 46·55	43 18·38	+2·675	−8·544	+32·00	+ 8·46
	161	m			·39483	52 41·59	43 19·14	+2·352	−8·555	+32·06	+ 8·45
XII_9*	169	f	Aug. 7.....	P	·53899	292 0 36·89	− 4 56 8·72	−3·909	−8·303	+31·99	+ 8·76
	170	f			·55475	0 30·15	56 11·23	−4·389	−8·266	+31·99	+ 8·76
XIII_8	174	e	Aug. 10..... (3)	P	·47906	291 41 41·48	− 5 4 36·59	−2·089	−8·287	+31·88	+ 8·83
XIII_9	175	f	Aug. 11.....	P	·46843	291 36 16·17	− 5 7 44·87	−1·792	−8·261	+31·86	+ 9·00
	176	e	(2)		·47759	36 13·29	7 46·65	−2·135	−8·250	+31·83	+ 8·88
	177	e			·48602	36 10·65	7 48·28	−2·445	−8·239	+31·83	+ 8·88
	178	f			·49581	36 7·58	7 50·19	−2·795	−8·223	+31·86	+ 9·00

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
		° ′	r	r	″	″	″			
117	w	143 47	1109·395							
118	w	144 42	1109·395	1·411	1110·806	1111·373	− 0·567	+ 0·578	− 0·816	+ 0·922
119	x	346 45	824·464	1·005	825·469	824·439	+ 1·030	− 0·229	+ 0·973	− 0·923
128	p	106 28	1320·687	0·885	1321·572	1322·179	− 0·607	+ 0·959	− 0·283	+ 0·595
130	q	285 4	1918·597	0·994	1919·591	1918·963	+ 0·628	− 0·966	+ 0·260	− 0·501
132	n	347 30	3806·228	4·097	3810·325	3809·030	+ 1·295	− 0·216	+ 0·976	− 0·897
133	l	150 27	3915·645	3·657	3919·302	3920·231	− 0·929	+ 0·493	− 0·870	+ 0·866
134	l	150 31	3913·962	3·488	3917·450	3917·982	− 0·532	+ 0·492	− 0·871	+ 0·853
135	n	347 15	3808·656	3·661	3812·317	3811·487	+ 0·830	− 0·221	+ 0·975	− 0·878
136	o	233 21	2393·124	1·449	2394·573	2395·058	− 0·485	− 0·802	− 0·597	+ 0·633
137	m	45 15	1063·873	0·815	1064·688	1063·446	+ 1·242	+ 0·710	+ 0·704	− 0·742
138	m	45 0	1057·990	0·886	1058·876	1057·895	+ 0·981	+ 0·707	+ 0·707	− 0·772
139	o	233 36	2410·476	1·884	2412·360	2412·791	− 0·431	− 0·805	− 0·593	+ 0·725
140	o	233 42	2417·300	2·140	2419·440	2419·986	− 0·546	− 0·806	− 0·592	+ 0·761
141	m	44 12	1040·394	1·233	1041·627	1040·073	+ 1·554	+ 0·697	+ 0·717	− 0·865
142	m	43 47	1031·013	1·522	1032·535	1031·392	+ 1·143	+ 0·692	+ 0·722	− 0·904
143	o	234 1	2439·065	3·564	2442·629	2442·795	− 0·166	− 0·809	− 0·588	+ 0·863
146	m	18 30	725·912	0·604	726·516	725·677	+ 0·839	+ 0·317	+ 0·948	− 0·705
149	m	16 59	717·447	0·575	718·022	716·831	+ 1·191	+ 0·292	+ 0·956	− 0·760
157	m	10 27	687·317	0·805	688·122	686·854	+ 1·268	+ 0·181	+ 0·983	− 0·897
158	m	329 30	704·201	0·873	705·074	704·155	+ 0·919	− 0·508	+ 0·862	− 0·911
159	k	140 17	844·859	0·862	845·721	846·403	− 0·682	+ 0·639	− 0·769	+ 0·850
160	k	140 38	841·970	0·791	842·761	843·250	− 0·489	+ 0·634	− 0·773	+ 0·829
161	m	328 2	711·944	0·676	712·620	711·785	+ 0·835	− 0·529	+ 0·848	− 0·850
169	f	44 58	447·718	0·272	447·990	202·369				
170	f	43 59	439·515	0·330	439·845	195·560				
174	e	44 43	1362·713	1·123	1363·836	1363·117	+ 0·719	+ 0·704	+ 0·711	− 0·735
175	f	247 6	1421·163	0·709	1421·872	1421·831	+ 0·041	− 0·921	− 0·389	+ 0·485
176	e	39 5	1002·732	0·894	1003·626	1002·926	+ 0·700	+ 0·630	+ 0·776	− 0·774
177	e	39 0	999·665	0·956	1000·621	999·817	+ 0·804	+ 0·629	+ 0·777	− 0·793
178	f	247 4	1431·934	0·927	1432·861	1432·694	+ 0·167	− 0·921	− 0·390	+ 0·578

* XII_9. Nos. 169, 170. Wrong star observed.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	183	e	Aug. 12.....	P	·45937	291 31 19·82	− 5 11 1·49	−1·549	−8·229	+31·78	+ 8·94
	185	e			·47781	31 14·59	11 5·22	−2·242	−8·207	+31·78	+ 8·94
XIII_{10}	186	e	(2)		·49185	31 10·61	11 8·07	−2·747	−8·188	+31·78	+ 8·94
	188	e			·52048	31 2·53	11 13·88	−3·707	−8·136	+31·78	+ 8·94
	189	e			·53045	30 59·71	11 15·90	−4·016	−8·111	+31·78	+ 8·94
	190	e	Aug. 16.....	P	·45877	291 16 33·11	− 5 25 27·85	−1·926	−8·062	+31·52	+ 9·14
	191	e			·47888	16 29·93	25 32·48	−2·642	−8·035	+31·52	+ 9·14
XIII_{11}	193	e	(1)		·49881	16 26·79	25 37·06	−3·312	−7·999	+31·52	+ 9·14
	194	e			·50870	16 25·24	25 39·34	−3·624	−7·978	+31·52	+ 9·14
	196	e			·52909	16 22·05	25 44·03	−4·224	−7·930	+31·52	+ 9·14
	197	f	Aug. 17.....	P	·46318	291 14 10·32	− 5 29 21·58	−2·177	−8·013	+31·50	+ 9·32
	198	a			·47444	14 8·90	29 24·24	−2·572	−7·997	+31·32	+ 8·94
XIV_7	199	a	(2)		·48615	14 7·44	29 27·00	−2·970	−7·977	+31·32	+ 8·94
	200	f			·49688	14 6·10	29 29·53	−3·322	−7·956	+31·49	+ 9·32
	201	c	Aug. 18.....	P	·34163	291 12 32·25	− 5 32 50·58	+2·252	−7·972	+31·27	+ 9·21
	202	d			·35208	12 31·23	32 53·10	+1·878	−7·985	+31·42	+ 9·11
XIV_8	203	d	(2)		·36800	12 29·69	32 56·92	+1·293	−8·000	+31·42	+ 9·11
	204	c			·37755	12 28·77	32 59·21	+0·935	−8·005	+31·26	+ 9·21
	205	f	Aug. 18.....	P	·45391	291 12 21·53	− 5 33 17·60	−1·932	−7·979	+31·41	+ 9·37
	206	a			·46479	12 20·52	33 20·22	−2·319	−7·963	+31·24	+ 8·99
	207	a			·47341	12 19·71	33 22·30	−2·618	−7·951	+31·24	+ 8·99
	208	f			·48392	12 18·74	33 24·83	−2·973	−7·932	+31·40	+ 9·37
XIV_9	209	f	(2)		·49846	12 17·40	33 28·33	−3·440	−7·905	+31·40	+ 9·37
	210	a			·50672	12 16·64	33 30·32	−3·695	−7·885	+31·23	+ 8·99
	211	a			·51563	12 15·82	33 32·47	−3·955	−7·864	+31·23	+ 8·99
	212	f			·52886	12 14·62	33 35·66	−4·323	−7·831	+31·40	+ 9·37
XIV_{10}	213	d	Aug. 20.....	P	·34418	291 10 23·33	− 5 41 1·47	+1·939	−7·898	+31·22	+ 9·19
	214	d	(2)		·35169	10 23·09	41 3·35	+1·671	−7·906	+31·22	+ 9·19
	220	d	Aug. 25.....	P	·44700	291 14 59·53	− 6 3 0·24	−2·258	−7·655	+30·64	+ 9·37
XV_9	221	d			·45599	15 0·78	3 2·64	−2·556	−7·639	+30·64	+ 9·37
	224	d	(2)		·49532	15 6·32	3 13·07	−3·749	−7·555	+30·63	+ 9·37

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r		″	″	″			
183	e	30 16	675·894	0·596	676·490	675·785	+ 0·705	+ 0·504	+ 0·864	— 0·789
185	e	30 0	669·403	0·665	670·068	669·617	+ 0·451	+ 0·500	+ 0·866	— 0·823
186	e	29 47	664·849	0·735	665·584	664·935	+ 0·649	+ 0·497	+ 0·868	— 0·847
188	e	29 21	655·368	0·953	656·321	655·483	+ 0·838	+ 0·490	+ 0·872	— 0·891
189	e	29 12	651·493	1·067	652·560	652·223	+ 0·337	+ 0·488	+ 0·873	— 0·903
190	e	242 28	611·268	0·361	611·629	611·624	+ 0·005	— 0·887	— 0·462	+ 0·542
191	e	242 15	616·838	0·445	617·283	617·193	+ 0·090	— 0·885	— 0·466	+ 0·608
193	e	242 3	622·162	0·565	622·727	622·667	+ 0·060	— 0·883	— 0·469	+ 0·666
194	e	241 57	625·043	0·645	625·688	625·363	+ 0·325	— 0·883	— 0·470	+ 0·694
196	e	241 44	629·949	0·882	630·831	630·879	— 0·048	— 0·881	— 0·474	+ 0·747
197	f	234 53	3213·215	2·289	3215·504	3215·285	+ 0·219	— 0·818	— 0·575	+ 0·639
198	a	62 0	3532·454	2·555	3535·009	3535·237	— 0·228	+ 0·883	+ 0·469	— 0·601
199	a	62 2	3529·489	2·895	3532·384	3532·315	+ 0·069	+ 0·883	+ 0·469	— 0·635
200	f	234 49	3221·493	3·244	3224·737	3224·186	+ 0·551	— 0·817	— 0·576	+ 0·728
201	c	156 30	1570·327	1·626	1571·953	1572·400	— 0·447	+ 0·399	— 0·917	+ 0·820
202	d	340 35	1337·745	1·350	1339·095	1338·450	+ 0·645	— 0·332	+ 0·943	— 0·815
203	d	340 27	1334·810	1·249	1336·059	1335·547	+ 0·512	— 0·335	+ 0·942	— 0·797
204	c	156 47	1576·160	1·359	1577·519	1578·471	— 0·952	+ 0·394	— 0·919	+ 0·773
205	f	232 42	3439·933	2·434	3442·367	3441·799	+ 0·568	— 0·795	— 0·606	+ 0·637
206	a	64 43	3330·919	2·131	3333·050	3333·108	— 0·058	+ 0·904	+ 0·427	— 0·549
207	a	64 44	3328·882	2·328	3331·210	3331·224	— 0·014	+ 0·904	+ 0·427	— 0·575
208	f	232 38	3446·579	3·246	3449·825	3449·174	+ 0·651	— 0·795	— 0·607	+ 0·716
209	f	232 37	3449·294	3·835	3453·129	3452·717	+ 0·412	— 0·795	— 0·607	+ 0·752
210	a	64 50	3320·648	3·494	3324·142	3324·101	+ 0·041	+ 0·905	+ 0·425	— 0·668
211	a	64 51	3318·758	3·984	3322·742	3322·225	+ 0·517	+ 0·905	+ 0·425	— 0·691
212	f	232 33	3454·763	5·936	3460·699	3460·013	+ 0·686	— 0·794	— 0·608	+ 0·817
213	d	323 32	962·228	0·879	963·107	962·335	+ 0·772	— 0·594	+ 0·804	— 0·750
214	d	323 27	961·442	0·833	962·275	961·117	+ 1·158	— 0·596	+ 0·803	— 0·734
220	d	208 54	621·341	0·678	622·019	622·192	— 0·173	— 0·483	— 0·875	+ 0·779
221	d	208 43	622·690	0·731	623·421	623·822	— 0·401	— 0·480	— 0·877	+ 0·792
224	d	207 55	629·195	1·113	630·308	630·878	— 0·570	— 0·468	— 0·884	+ 0·843

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TABLE D.—GÖTTINGEN DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
I_2	1	κ	June 11..... (3)	S	·56543	300 48 11·03	− 8 42 38·42	+1·998	−7·885	+21·05	+ 3·89
	2	μ			·58724	48 10·07	42 25·64	+1·232	−7·917	+20·85	+ 4·11
II_8	3	θ	June 18..... ( )	S	·55328	300 30 28·88	− 7 37 17·16	+1·803	−8·181	+23·52	+ 4·46
	4	μ			·58320	30 21·10	37 1·22	+0·686	−8·213	+23·38	+ 4·98
III_{18}*	9	λ	June 21.....	S	·46155	300 15 48·32	− 7 12 7·86	+4·517	−8·076	+24·35	+ 4·96
	10	λ			·48123	15 41·51	11 57·94	+3·968	−8·143	+24·35	+ 4·96
	13	θ			·54872	15 18·08	11 23·92	+1·675	−8·296	+24·51	+ 4·85
	14	θ			·55674	15 15·29	11 19·88	+1·370	−8·307	+24·51	+ 4·85
III_{19}	17	λ	June 22.....	S	·55130	300 9 14·58	− 7 3 4·18	+1·475	−8·339	+24·70	+ 5·10
	18	θ			·57167	9 6·90	2 54·14	+0·688	−8·356	+24·83	+ 4·99
	19	θ			·58269	9 2·73	2 48·71	+0·258	−8·362	+24·83	+ 4·99
	20	λ			·60357	8 54·83	2 38·42	−0·546	−8·360	+24·71	+ 5·11
III_{20}	21	θ	June 24.....	S	·46458	299 56 22·29	− 6 47 40·78	+4·249	−8·230	+25·42	+ 5·22
	22	θ			·47590	56 17·43	47 35·44	+3·912	−8·263	+25·42	+ 5·22
III_{21}	27	θ	June 25.....	S	·46727	299 48 57·59	− 6 39 53·50	+4·102	−8·279	+25·71	+ 5·34
	28	θ			·47956	48 51·97	39 47·85	+3·720	−8·314	+25·71	+ 5·34
IV_{23}	33	ε	June 26.....	S	·45663	299 41 12·84	− 6 32 24·14	+4·342	−8·289	+26·05	+ 5·19
	34	λ			·47144	41 5·69	32 17·51	+3·899	−8·330	+25·91	+ 5·59
	35	λ			·48914	40 57·14	32 9·57	+3·321	−8·377	+25·92	+ 5·59
	36	ε			·50476	40 49·59	32 2·57	+2·780	−8·411	+26·06	+ 5·20
V_{15}	37	β	July 4.....	S	·43482	298 24 52·81	− 5 39 47·55	+4·373	−8·516	+28·22	+ 6·08
	38	δ			·44630	24 45·30	39 43·65	+4·012	−8·549	+28·28	+ 6·33
	39	δ			·45516	24 39·49	39 40·64	+3·721	−8·567	+28·28	+ 6·33
	40	β			·46452	24 33·36	39 37·47	+3·402	−8·588	+28·22	+ 6·08
VI_7	47	y	July 9.....	S	·60007	297 25 17·51	− 5 13 54·23	−2·610	−8·714	+29·41	+ 6·70
	48	x			·61303	25 8·12	13 50·85	−3·094	−8·694	+29·50	+ 6·67
	49	x			·62260	25 1·19	13 48·35	−3·438	−8·676	+29·50	+ 6·67

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OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
		° ′	r	r	″	″	″			
1	κ	112 8	2044·539	1·254	2045·793	2045·913	− 0·120	+ 0·926	− 0·377	+ 0·480
2	μ	313 32	2400·938	2·019	2402·957	2402·757	+ 0·200	− 0·725	+ 0·689	− 0·634
3	θ	138 15	3497·480	3·220	3500·700	3501·469	− 0·769	+ 0·666	− 0·746	+ 0·729
4	μ	333 18	6238·423	6·194	6244·617	6243·711	+ 0·906	− 0·449	+ 0·893	− 0·764
9	λ	287 39	1619·086	2·422	1621·508	1622·431	− 0·923	− 0·953	+ 0·303	− 0·672
10	λ	287 54	1630·165	1·727	1631·892	1632·398	− 0·506	− 0·952	+ 0·307	− 0·625
13	θ	126 35	1776·292	1·278	1777·570	1777·854	− 0·284	+ 0·803	− 0·596	+ 0·629
14	θ	126 32	1771·219	1·192	1772·411	1772·984	− 0·573	+ 0·804	− 0·595	+ 0·603
17	λ	298 5	2198·521	1·272	2199·793	2199·210	+ 0·583	− 0·882	+ 0·471	− 0·523
18	θ	117 28	1191·316	0·571	1191·887	1192·481	− 0·594	+ 0·887	− 0·461	+ 0·446
19	θ	117 20	1184·806	0·524	1185·330	1185·930	− 0·600	+ 0·888	− 0·459	+ 0·406
20	λ	298 24	2229·090	0·901	2229·991	2230·460	− 0·469	− 0·880	+ 0·476	− 0·350
21	θ	39 45	471·316	0·262	471·578	472·394	− 0·816	+ 0·640	+ 0·769	− 0·363
22	θ	38 52	472·492	0·269	472·761	473·233	− 0·472	+ 0·628	+ 0·779	− 0·399
27	θ	350 26	840·915	1·488	842·403	841·981	+ 0·422	− 0·166	+ 0·986	− 0·884
28	θ	350 6	847·777	1·323	849·100	848·527	+ 0·573	− 0·172	+ 0·985	− 0·882
33	ε	154 9	4977·316	9·570	4986·886	4987·902	− 1·016	+ 0·436	− 0·900	+ 0·934
34	λ	308 33	4618·593	6·761	4625·354	4624·205	+ 1·149	− 0·782	+ 0·623	− 0·822
35	λ	308 33	4631·601	5·394	4636·995	4636·225	+ 0·770	− 0·782	+ 0·623	− 0·780
36	ε	154 18	4951·352	5·783	4957·135	4957·867	− 0·732	+ 0·434	− 0·901	+ 0·878
37	β	166 12	3746·735	6·365	3753·100	3754·142	− 1·042	+ 0·239	− 0·970	+ 0·930
38	δ	333 27	4075·172	6·840	4082·012	4080·990	+ 1·022	− 0·447	+ 0·895	− 0·943
39	δ	333 23	4081·348	6·203	4087·551	4086·377	+ 1·174	− 0·448	+ 0·894	− 0·932
40	β	166 28	3734·799	4·766	3739·565	3739·611	− 0·046	+ 0·233	− 0·972	+ 0·914
47	y	240 9	1838·344	1·266	1839·610	1840·239	− 0·629	− 0·867	− 0·498	+ 0·660
48	x	72 42	1187·931	0·714	1188·645	1188·930	− 0·285	+ 0·955	+ 0·297	− 0·552
49	x	72 28	1181·813	0·798	1182·611	1182·765	− 0·154	+ 0·954	+ 0·302	− 0·589

* III_{18}. Rejected for discordance, probably due to long interruption between Nos. 10 and 13 and change of scale-value in the interval, the "Set" not being symmetrical.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VI_6	53	x	July 10.....	S	·57381	297 13 27·59	− 5 9 47·64	−1·712	−8·751	+29·69	+ 6·77
	54	x			·58707	13 17·86	9 44·38	−2·239	−8·738	+29·69	+ 6·78
VI_9	56	x	July 11.....	S	·44659	297 2 44·06	− 5 6 19·34	+3·279	−8·703	+29·75	+ 6·87
	57	w			·50986	1 57·18	6 4·70	+0·787	−8·777	+29·85	+ 6·84
	58	w			·52064	1 49·19	6 2·21	+0·340	−8·781	+29·85	+ 6·84
	59	x			·53973	1 35·04	5 57·82	−0·444	−8·781	+29·77	+ 6·88
VII_{16}*	60	u	July 16.....	S	·48588	295 59 21·25	− 4 50 15·20	+1·103	−8·795	+30·71	+ 7·30
XI_{15}†	61	m	July 31.....	S	·44815	293 2 3·77	− 4 42 0·78	+0·616	−8·628	+32·02	+ 8·38
	64	m			·48575	1 41·07	42 3·68	−0·919	−8·625	+32·02	+ 8·38
	69	m			·61841	0 21·23	42 14·02	−5·410	−8·391	+32·03	+ 8·39
XI_{16}	71	k	Aug. 1.....	S	·39792	292 52 39·79	− 4 43 19·41	+2·486	−8·569	+32·00	+ 8·46
	72	m			·40798	52 33·92	43 20·31	+2·099	−8·578	+32·06	+ 8·45
	73	m			·41700	52 28·66	43 21·11	+1·744	−8·587	+32·06	+ 8·45
	74	k			·42912	52 21·60	43 22·19	+1·259	−8·598	+32·00	+ 8·46
XII_{14}	75	g	Aug. 5.....	S	·42718	292 16 41·59	− 4 50 56·44	+0·816	−8·493	+32·00	+ 8·67
	78	g			·46635	16 22·60	51 1·80	−0·758	−8·492	+32·00	+ 8·68
XII_{15}	81	f	Aug. 6.....	S	·53784	292 7 59·16	− 4 53 34·87	−3·549	−8·377	+32·01	+ 8·69
XII_{16}‡	82	f	Aug. 8.....	S	·51984	291 53 50·60	− 4 58 49·15	−3·114	−8·331	+31·96	+ 8·82
	85	f			·56113	53 34·09	58 56·11	−4·429	−8·245	+31·96	+ 8·82
XIII_{16}§	91	e	Aug. 10.....	S	·52508	291 41 25·71	− 5 4 45·15	−3·466	−8·240	+31·88	+ 8·83
	92	f			·53755	41 21·45	4 47·49	−3·866	−8·216	+31·90	+ 8·95
XIII_{17}	93	f	Aug. 11.....	S	·47735	291 36 13·37	− 5 7 46·60	−1·866	−8·277	+31·86	+ 9·00
XIII_{18}	97	e	Aug. 16.....	S	·52363	291 16 22·90	− 5 25 42·77	−3·857	−7·977	+31·50	+ 9·14
	98	e			·53543	16 21·06	25 45·49	−4·194	−7·949	+31·50	+ 9·14
XIV_1	100	c	Aug. 17.....	S	·38631	291 14 20·10	− 5 29 3·50	+0·966	−8·064	+31·35	+ 9·17
	101	d			·40043	14 18·29	29 6·81	+0·431	−8·068	+31·50	+ 9·07
	102	d			·41181	14 16·83	29 9·49	+0·002	−8·070	+31·50	+ 9·08
	103	c			·42658	14 14·95	29 12·96	−0·556	−8·068	+31·35	+ 9·18

* VII_{16} Rejected because of the uncertainty of the correction for "crossing through" in so small a distance when ψ is not observed.

† XI_{15} No. 69. Rejected—time not noted for each pointing.

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f'	f'''
		° ′	″	″	″	″	″			
53	x	36 20	740·211	0·608	740·819	740·667	+ 0·152	+ 0·593	+ 0·806	— 0·806
54	x	35 32	736·537	0·669	737·206	737·311	— 0·105	+ 0·581	+ 0·814	— 0·841
56	x	346 14	828·135	1·002	829·137	828·766	+ 0·371	— 0·238	+ 0·971	— 0·923
57	w	146 56	1058·249	0·803	1059·052	1059·660	— 0·608	+ 0·546	— 0·838	+ 0·779
58	w	147 14	1051·035	0·765	1051·800	1053·001	— 1·201	+ 0·541	— 0·841	+ 0·756
59	x	341 56	869·292	0·714	870·006	869·274	+ 0·732	— 0·310	+ 0·951	— 0·821
60	u	125 57	214·385	0·122	214·507	214·636	— 0·129	+ 0·810	— 0·587	+ 0·606
61	m	14 55	705·955	0·589	706·544	706·044	+ 0·500	+ 0·257	+ 0·966	— 0·818
64	m	13 4	697·117	0·630	697·747	697·390	+ 0·357	+ 0·226	+ 0·974	— 0·863
69	m	6 16	672·233	1·865	674·098	673·269	+ 0·829	+ 0·109	+ 0·994	— 0·893
71	k	141 3	837·558	0·767	838·325	839·697	— 1·372	+ 0·629	— 0·778	+ 0·823
72	m	327 27	714·578	0·653	715·231	714·985	+ 0·246	— 0·538	+ 0·843	— 0·836
73	m	327 2	716·367	0·617	716·984	717·334	— 0·350	— 0·544	+ 0·839	— 0·815
74	k	142 13	827·895	0·624	828·519	829·884	— 1·365	+ 0·613	— 0·790	+ 0·756
75	g	145 34	714·046	0·525	714·571	715·751	— 1·180	+ 0·565	— 0·825	+ 0·746
78	g	147 10	706·952	0·460	707·412	708·859	— 1·447	+ 0·542	— 0·840	+ 0·672
81	f	63 2	654·243	0·584	654·827	655·175	— 0·348	+ 0·891	+ 0·454	— 0·695
82	f		302·394							
85	f		302·201							
91	e	44 27	1343·005	1·584	1344·589	1345·065	— 0·476	+ 0·700	+ 0·714	— 0·830
92	f	249 33	1075·234	0·974	1076·208	1075·617	+ 0·591	— 0·937	— 0·349	+ 0·648
93	f	247 5	1424·315	0·721	1425·036	1425·154	— 0·118	— 0·921	— 0·389	+ 0·493
97	e	241 47	627·630	0·731	628·361	629·245	— 0·884	— 0·881	— 0·473	+ 0·716
98	e	241 39	631·248	0·880	632·128	632·422	— 0·294	— 0·880	— 0·475	+ 0·745
100	c	148 53	1416·865	1·134	1417·999	1418·999	— 1·000	+ 0·516	— 0·856	+ 0·740
101	d	347 8	1526·436	1·359	1527·795	1526·902	+ 0·893	— 0·223	+ 0·975	— 0·797
102	d	347 3	1524·184	1·330	1525·514	1524·700	+ 0·814	— 0·224	+ 0·975	— 0·787
103	c	149 19	1422·078	0·984	1423·062	1423·717	— 0·655	+ 0·510	— 0·860	+ 0·666

‡ XII^{16} Wrong star seems to have been observed.
§ XIII_{16} Rejected for discordance; one Distance observed with prism, one without prism.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XIV$_{16}$ *	104	d	Aug. 20.....	S	·36641	291 10 22·64	− 5 41 7·03	+1·374	−7·932	+31·22	+ 9·19
	105	d			·37503	10 22·38	41 9·18	+1·059	−7·936	+31·22	+ 9·19
XIV$_{17}$	107	b	Aug. 20.....	S	·49095	291 10 19·10	− 5 41 38·16	−3·111	−7·853	+31·17	+ 9·02
	108	e			·50397	10 18·76	41 41·42	−3·516	−7·826	+31·16	+ 9·32
	109	e			·52207	10 18·29	41 45·95	−4·041	−7·783	+31·16	+ 9·32
	110	b			·53788	10 17·90	41 49·92	−4·452	−7·738	+31·17	+ 9·02
XV$_{10}$	111	d	Aug. 22.....	S	·50137	291 10 33·44	− 5 50 9·02	−3·557	−7·732	+30·99	+ 9·27
XV$_{11}$	113	d	Aug. 25.....	S	·45153	291 15 0·16	− 6 3 1·46	−2·176	−7·674	+30·64	+ 9·37
	116	d			·52425	15 10·43	3 20·75	−4·307	−7·512	+30·63	+ 9·37

* XIV$_{16}$ This group was inadvertently omitted in the discussion of Ephemeris I; it is included in the definitive discussion, Ephemeris II.

TABLE E.—BAMBERG DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
IV$_{24}$	1	λ	June 26.....	Hg	·55447	299 40 25·50	− 6 31 40·34	+0·823	−8·326	+25·93	+ 5·60
	2	ε			·58581	40 10·29	31 26·33	−0·464	−8·333	+26·08	+ 5·21
	3	ε			·60232	40 2·26	31 18·96	−1·135	−8·324	+26·09	+ 5·21
VII$_{17}$	7	t	July 18.....	Hg	·55077	295 33 7·46	− 4 45 38·82	−2·039	−8·605	+31·01	+ 7·49
	10	t			·60251	32 28·10	45 32·77	−4·037	−8·522	+31·02	+ 7·50
VIII$_{11}$	13	q	July 20.....	Hg	·57156	295 7 37·23	− 4 42 14·96	−3·138	−8·560	+31·27	+ 7·61
	16	q			·61916	7 1·42	42 10·94	−4·807	−8·462	+31·28	+ 7·62
VIII$_{12}$	18	q	July 22.....	Hg	·54377	294 43 5·58	− 4 39 59·18	−2·294	−8·586	+31·48	+ 7·80
XI$_{17}$	24	m	July 31.....	Hg	·54393	293 1 6·01	− 4 42 8·18	−3·386	−8·387	+32·02	+ 8·39
	27	m			·60154	0 31·37	42 12·69	−5·238	−8·256	+32·03	+ 8·39

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Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f′	f″	f‴
		° ′	r	r	″	″	″			
104	d	323 17	958·133	0·791	958·924	958·593	+ 0·331	— 0·598	+ 0·802	— 0·718
105	d	323 10	956·644	0·751	957·395	957·202	+ 0·193	— 0·600	+ 0·800	— 0·698
107	b	29 41	2903·159	3·851	2907·010	2906·967	+ 0·043	+ 0·496	+ 0·869	— 0·836
108	e	216 6	1552·640	2·196	1554·836	1554·768	+ 0·068	— 0·588	— 0·809	+ 0·839
109	e	216 2	1556·054	2·791	1558·845	1558·982	— 0·137	— 0·588	— 0·809	+ 0·865
110	b	29 45	2889·383	7·119	2896·502	2895·594	+ 0·908	+ 0·497	+ 0·868	— 0·892
111	d	291 46	610·445	0·166	610·611	610·577	+ 0·034	— 0·929	+ 0·371	+ 0·042
113	d	208 47	621·853	0·676	622·529	622·929	—0·400	— 0·482	— 0·876	+ 0·777
116	d	207 19	633·720	1·572	635·292	636·002	[—0·710]*	— 0·459	— 0·889	+ 0·865

* No. 116 is rejected because the prism was not used in the last two pointings.

OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f′	f″	f‴
		° ′	r	r	″	″	″			
1	λ	308 34	4679·152	2·658	4681·810	4681·012	+ 0·798	— 0·782	+ 0·623	— 0·583
2	ε	154 34	4903·546	3·402	4906·948	4906·844	+ 0·104	+ 0·430	— 0·903	+ 0·732
3	ε	154 37	4893·324	3·292	4896·615	4896·468	+ 0·147	+ 0·429	— 0·903	+ 0·703
4	t	271 39	810·006	0·232	810·238	810·083	+ 0·155	— 1·000	+ 0·029	+ 0·178
5	t	271 59	851·354	0·355	851·709	851·479	+ 0·230	— 0·999	+ 0·035	+ 0·372
6	q	73 12	1007·127	0·542	1007·669	1007·582	+ 0·087	+ 0·957	+ 0·289	— 0·548
7	q	72 20	972·155	0·994	973·149	973·109	+ 0·040	+ 0·953	+ 0·303	— 0·714
8	q	310 24	658·758	0·254	659·012	658·468	+ 0·544	— 0·762	+ 0·648	— 0·732
9	m	10 6	685·967	0·725	686·691	685·710	+ 0·981	+ 0·175	+ 0·985	— 0·885
10	m	7 8	675·945	1·278	677·223	675·922	+ 1·301	+ 0·124	+ 0·992	— 0·884

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TABLE F.—CAPE POSITION-ANGLES, COMPARISON

1.	2	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
I_3 *	1	μ	June 10 ...	A	·48865	300 48 39·76	− 8 53 13·38	+4·957	+4·104	+20·43	+ 3·97
	2	μ			·49783	48 39·67	53 7·94	+4·610	+4·061	+20·43	+ 3·97
II_9	11	μ	June 16 ...	A	·47687	300 38 21·85	− 7 56 2·36	+4·951	+4·364	+22·64	+ 4·72
	12	θ	(2)		·48716	38 19·84	55 56·69	+4·538	+4·322	+22·82	+ 4·18
	13	θ			·49395	38 18·50	55 52·95	+4·254	+4·296	+22·82	+ 4·18
	14	μ			·50370	38 16·59	55 47·58	+3·832	+4·261	+22·65	+ 4·73
II_{10}	15	μ	June 17 ...	G	·44661	300 34 57·32	− 7 47 12·22	+5·984	+4·535	+22·98	+ 4·84
	16	θ	(2)		·46283	34 53·65	47 3·41	+5·410	+4·457	+23·16	+ 4·32
	17	θ			·47710	34 50·42	46 55·69	+4·860	+4·396	+23·16	+ 4·32
	18	μ			·49724	34 45·84	46 44·77	+4·013	+4·321	+23·00	+ 4·85
II_{11}	27	μ	June 18 ...	A	·42190	300 31 2·69	− 7 38 27·24	+6·691	+4·692	+23·32	+ 4·96
	28	θ	(2)		·43347	30 59·74	38 21·06	+6·347	+4·629	+23·48	+ 4·45
	29	θ			·44154	30 57·67	38 16·75	+6·087	+4·589	+23·48	+ 4·45
	30	μ			·45007	30 55·49	38 12·20	+5·796	+4·546	+23·33	+ 4·96
III_{22}	44	θ	June 21 ...	G	·40270	300 16 8·62	− 7 12 37·58	+7·087	+4·873	+24·46	+ 4·83
	45	λ	(2)		·41572	16 4·14	12 31·00	+6·728	+4·802	+24·33	+ 4·96
	46	λ			·42755	16 0·06	12 25·03	+6·363	+4·741	+24·33	+ 4·96
	47	θ			·43974	15 55·85	12 18·87	+5·949	+4·684	+24·47	+ 4·84
III_{23}	54	λ	June 22 ...	A	·42845	300 10 0·66	− 7 4 4·84	+6·265	+4·763	+24·66	+ 5·09
	55	θ	(1)		·43446	9 58·41	4 1·88	+6·058	+4·735	+24·78	+ 4·97
	56	θ			·43914	9 56·67	3 59·56	+5·894	+4·714	+24·78	+ 4·97
	57	λ			·44802	9 53·35	3 55·18	+5·565	+4·676	+24·66	+ 5·09
III_{24}	63	θ	June 22 ...	G	·65839	300 8 34·04	− 7 2 11·44	−4·536	+4·592	+24·85	+ 5·00
	64	λ	(1)		·67223	8 28·78	2 4·63	−5·119	+4·640	+24·74	+ 5·12
	68	θ			·72278	8 9·52	1 39·78	−6·886	+4·877	+24·87	+ 5·00
	69	λ			·73155	8 6·17	1 35·47	−7·125	+4·922	+24·75	+ 5·13
III_{25}	76	θ	June 23 ...	G	·48037	300 3 12·26	− 6 55 30·70	+4·597	+4·105	+25·12	+ 5·09
	77	θ	(2)		·49067	3 8·11	55 25·73	+3·628	+4·560	+25·12	+ 5·09

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OF OBSERVED AND TABULAR QUANTITIES.

13. Rotation No.	14. Star.	15. Approximate Distance.	16. Observed Position-Angle.	17. Refraction.	18. Observed Position-Angle Corrected for Refraction.	19. Tabular Position-Angle.	20. O–C.	21. O–C on Great Circle.	22. f_p'	23. f_p''	24. f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
1	μ	1989	52 0	− 24	300 51 36	49 36	+ 2 0	+ 1·157	+ 0·513	+ 0·858	+ 0·603
2	μ	1992	58 54	− 20	300 58 34	57 13	+ 1 21	+ 0·782	+ 0·515	+ 0·857	+ 0·583
11	μ	5020	26 6	+ 6	332 26 12	25 44	+ 0 28	+ 0·682	+ 0·886	+ 0·463	+ 0·636
12	θ	4656	0 40	+ 1	143 0 41	0 56	− 0 15	− 0·339	− 0·799	− 0·601	− 0·619
13	θ	4652	0 20	+ 2	143 0 22	0 14	+ 0 8	+ 0·180	− 0·799	− 0·601	− 0·594
14	μ	5036	27 19	+ 6	332 27 25	26 32	+ 0 53	+ 1·294	+ 0·887	+ 0·463	+ 0·534
15	μ	5584	7 2	+ 7	333 7 9	6 34	+ 0 35	+ 0·948	+ 0·892	+ 0·452	+ 0·733
16	θ	4111	48 24	− 5	140 48 19	48 32	− 0 13	− 0·259	− 0·775	− 0·632	− 0·697
17	θ	4102	46 50	− 2	140 46 48	46 54	− 0 6	− 0·119	− 0·775	− 0·632	− 0·652
18	μ	5614	7 1	+ 6	333 7 7	6 49	+ 0 18	+ 0·490	+ 0·892	+ 0·452	+ 0·549
27	μ	6157	23 35	+ 10	333 23 45	23 32	+ 0 13	+ 0·388	+ 0·894	+ 0·448	+ 0·803
28	θ	3563	22 50	− 18	138 22 32	22 42	− 0 10	− 0·173	− 0·748	− 0·664	− 0·778
29	θ	3558	21 50	− 14	138 21 36	21 38	− 0 2	− 0·035	− 0·747	− 0·664	− 0·756
30	μ	6174	23 47	+ 7	333 23 54	23 15	+ 0 39	+ 1·168	+ 0·894	+ 0·448	+ 0·718
44	θ	1859	3 13	− 67	127 2 6	3 47	− 1 41	− 0·910	− 0·602	− 0·798	− 0·812
45	λ	1602	32 51	− 79	287 31 32	30 0	+ 1 32	+ 0·715	+ 0·301	+ 0·954	+ 0·759
46	λ	1608	41 5	− 61	287 40 4	39 13	+ 0 51	+ 0·398	+ 0·303	+ 0·953	+ 0·755
47	θ	1836	51 31	− 28	126 51 3	51 42	− 0 39	− 0·347	− 0·600	− 0·800	− 0·728
54	λ	2132	36 50	− 47	297 36 3	35 49	+ 0 14	+ 0·145	+ 0·463	+ 0·886	+ 0·709
55	θ	1268	28 11	− 39	118 27 32	29 0	− 1 28	− 0·541	− 0·476	− 0·879	− 0·703
56	θ	1265	24 44	− 35	118 24 9	25 59	− 1 50	− 0·675	− 0·476	− 0·879	− 0·692
57	λ	2144	44 50	− 30	297 44 20	43 32	+ 0 48	+ 0·499	+ 0·465	+ 0·885	+ 0·671
63	θ	1134	49 13	+ 19	115 49 32	51 27	− 1 55	− 0·632	− 0·435	− 0·900	− 0·217
64	λ	2280	5 3	+ 18	299 5 21	4 37	+ 0 44	+ 0·486	+ 0·486	+ 0·874	+ 0·159
68	θ	1096	56 29	+ 39	114 57 8	57 45	− 0 37	− 0·197	− 0·422	− 0·907	− 0·155
69	λ	2315	25 30	+ 29	299 25 59	25 9	+ 0 50	+ 0·561	+ 0·491	+ 0·871	+ 0·082
76	θ	715	29 21	− 21	97 29 0	32 0	− 3 0	− 0·624	− 0·130	− 0·991	− 0·467
77	θ	710	5 33	− 17	97 5 16	11 16	− 6 0	− 1·239	− 0·123	− 0·992	− 0·496

* I_2 Rejected—a star having been inadvertently observed instead of the planet.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III_{26} *	83	θ	June 25.....	A	·67240	299 47 23·34	− 6 38 19·36	−5·492	+4·715	+25·78	+ 5·37
	84	θ	(3)		·67898	47 20·30	38 16·34	−5·745	+4·742	+25·78	+ 5·37
V_{16}	218	z	July 5.....	G	·41838	298 14 1·35	− 5 34 20·55	+5·401	+5·093	+28·53	+ 6·27
	219	z			·42966	13 53·80	34 16·89	+4·906	+5·058	+28·53	+ 6·27
	220	z	(1)		·44297	13 44·87	34 12·56	+4·290	+5·024	+28·53	+ 6·27
	221	z			·45131	13 39·28	34 9·85	+3·889	+4·998	+28·53	+ 6·27
V_1 †	227	z	July 5.....	A	·64568	298 11 28·60	− 5 33 7·03	−5·996	+5·147	+28·58	+ 6·29
	228	z			·65471	11 22·51	33 4·12	−6·345	+5·181	+28·58	+ 6·29
	229	z			·65994	11 18·99	33 2·44	−6·537	+5·203	+28·58	+ 6·29
	230	z			·67227	11 10·68	32 58·47	−6·962	+5·254	+28·58	+ 6·30
VI_{10}	260	x	July 10.....	G	·68503	297 12 5·94	− 5 9 20·43	−7·886	+5·481	+29·71	+ 6·79
	261	x	(1)		·68985	12 2·39	9 19·25	−8·002	+5·503	+29·71	+ 6·79
VI_{11} ‡	270	w	July 13.....	A	·63870	296 35 23·75	− 4 58 29·72	−6·827	+5·375	+30·23	+ 7·07
	271	v			·65088	35 14·55	58 27·33	−7·234	+5·422	+30·27	+ 7·03
VII_{18} §	275	u	July 16.....	G	·65496	295 57 12·31	− 4 49 49·97	−7·672	+5·505	+30·74	+ 7·31
	276	u	(3)		·66890	57 1·68	49 47·91	−8·029	+5·563	+30·74	+ 7·31
	277	u			·67920	56 53·83	49 46·39	−8·256	+5·606	+30·74	+ 7·31
VII_{19}	278	t	July 17.....	G	·33854	295 48 30·97	− 4 48 12·69	+7·078	+5·433	+30·84	+ 7·37
	279	t			·34333	48 27·32	48 12·04	+6·914	+5·417	+30·84	+ 7·37
	280	t			·34969	48 22·47	48 11·17	+6·685	+5·393	+30·84	+ 7·37
	281	t			·35483	48 18·55	48 10·46	+6·494	+5·375	+30·85	+ 7·37
	282	t	(1)		·36133	48 13·60	48 9·57	+6·243	+5·353	+30·85	+ 7·37
	283	t			·36843	48 8·19	48 8·61	+5·954	+5·331	+30·85	+ 7·37
	284	t			·37731	48 1·41	48 7·41	+5·578	+5·303	+30·85	+ 7·37
	285	t			·38442	47 55·99	48 6·44	+5·264	+5·283	+30·85	+ 7·38
VII_{20}	290–1	t	July 17.....	A	·61692	295 44 58·75	− 4 47 35·25	−6·531	+5·380	+30·88	+ 7·40
	294–5	t	(3)		·63536	44 44·69	47 32·81	−7·178	+5·446	+30·88	+ 7·40
	296–7	t			·64222	44 39·46	47 31·91	−7·397	+5·473	+30·89	+ 7·40
	302–3	t			·66486	44 22·20	47 28·92	−8·016	+5·566	+30·89	+ 7·40

* III_{26} Rejected for discordance ; images described as "Scarcely measureable."
† V_{17} Rejected. Some systematic error appears to have been made in reading the position-circle in all the observations of the set.

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O-C.	O-C on Great Circle.	f_p'	f_p''	f_p'''
		"	′ ″	″	° ′ ″	′ ″	′ ″	″			
83	θ	968	25 56	− 25	345 25 31	27 46	− 2 15	− 0·634	+ 0·968	+ 0·252	− 0·409
84	θ	972	19 30	− 30	345 19 0	19 15	− 0 15	− 0·071	+ 0·967	+ 0·253	− 0·432
218	z	828	53 55	− 26	112 53 29	56 58	− 3 29	− 0·839	− 0·389	− 0·921	− 0·678
219	z	819	51 32	− 20	112 51 12	56 2	− 4 50	− 1·152	− 0·388	− 0·922	− 0·657
220	z	809	51 51	− 14	112 51 37	54 59	− 3 22	− 0·792	− 0·388	− 0·921	− 0·628
221	z	802	51 14	− 11	112 51 3	54 19	− 3 16	− 0·762	− 0·388	− 0·922	− 0·611
227	z	649	1 32	+ 28	112 2 0	35 42	−33 42	− 6·362	− 0·375	− 0·927	− 0·253
228	z	642	52 45	+ 32	112 53 17	34 21	+18 56	+ 3·536	− 0·389	− 0·921	− 0·231
229	z	638	48 38	+ 34	112 49 12	33 31	+15 41	+ 2·907	− 0·388	− 0·922	− 0·227
230	z	628	59 53	+ 40	112 0 33	31 30	−30 57	− 5·654	− 0·375	− 0·927	− 0·227
260	x	728	46 14	− 20	28 45 54	49 55	− 4 1	− 0·851	+ 0·877	− 0·481	− 0·952
261	x	728	30 6	− 24	28 29 42	32 6	− 2 24	− 0·508	+ 0·879	− 0·477	− 0·962
270	w	1100	37 2	+ 55	247 37 57	36 36	+ 1 21	+ 0·432	− 0·381	+ 0·925	+ 0·757
271	v	1230	0 12	+ 81	90 1 33	5 17	− 3 44	− 1·336	0·000	− 1·000	− 0·542
275	u	94	49 4	− 88	156 47 36	67 1	−19 25	− 0·531	− 0·919	− 0·394	+ 0·485
276	u	88	54 30	−142	162 52 8	69 8	−17 0	− 0·435	− 0·956	− 0·295	+ 0·601
277	u	85	41 2	−199	167 37 43	64 2	−26 19	− 0·651	− 0·977	− 0·214	+ 0·684
278	t	167	0 36	− 25	134 0 11	9 12	− 9 1	− 0·438	− 0·695	− 0·719	− 0·880
279	t	164	48 38	− 20	134 48 18	55 12	− 6 54	− 0·329	− 0·705	− 0·710	− 0·870
280	t	160	55 16	− 14	135 55 2	59 11	− 4 9	− 0·193	− 0·718	− 0·696	− 0·853
281	t	156	47 35	− 10	136 47 25	53 34	− 6 9	− 0·279	− 0·729	− 0·685	− 0·840
282	t	152	55 57	− 6	137 55 51	65 44	− 9 53	− 0·437	− 0·742	− 0·670	− 0·819
283	t	148	24 38	− 2	139 24 36	29 29	− 4 53	− 0·210	− 0·759	− 0·651	− 0·797
284	t	142	20 20	+ 2	141 20 22	21 58	− 1 36	− 0·066	− 0·781	− 0·625	− 0·765
285	t	138	48 39	+ 5	142 48 44	58 37	− 9 53	− 0·397	− 0·797	− 0·605	− 0·736
290-1	t	132	28 7	+ 28	233 28 35	6 58	+21 37	+ 0·830	− 0·595	+ 0·805	+ 0·820
294-5	t	142	47 17	+ 54	237 48 11	28 25	+19 46	+ 0·817	− 0·533	+ 0·846	+ 0·842
296-7	t	146	16 38	+ 68	238 77 46	55 21	+22 25	+ 0·952	− 0·511	+ 0·860	+ 0·846
302-3	t	160	30 47	+137	243 33 4	9 20	+23 44	+ 1·105	− 0·445	+ 0·895	+ 0·854

‡ VI_{11} Rejected. Observations of July 13; Auwers' note "Observations worth nothing. Images extremely diffused and very faint. The bright star — 5°·5075 appeared like a planetary nebula sometimes quite 40″ in diameter, and the planet as well as — 4°·4960 could be generally only seen as a faint ghost. Fog with full moon near planet. Western sky clouded up after these bisections."

§ VII_{18} Measured as half distances. Unreliable and rejected.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VII$_{21}$	308	t	July 18..... (3)	A	·35405	295 35 37·14	− 4 46 2·16	+6·401	+5·371	+30·99	+ 7·47
	309	t			·35716	35 34·77	46 1·78	+6·281	+5·361	+30·99	+ 7·47
	310	t			·36119	35 31·70	46 1·30	+6·117	+5·349	+30·99	+ 7·47
	311	t			·36395	35 29·60	46 0·97	+6·007	+5·340	+30·99	+ 7·47
VII$_{22}$	317	t	July 18..... (1)	G	·63510	295 32 3·30	− 4 45 28·98	−7·281	+5·461	+31·02	+ 7·50
	318	t			·64104	31 58·78	45 28·29	−7·464	+5·485	+31·02	+ 7·50
VII$_{23}$	331	t	July 19..... (1)	G	·35539	295 22 56·25	− 4 44 9·74	+6·217	+5·360	+31·12	+ 7·57
	332	q			·36336	22 50·21	44 8·91	+5·892	+5·335	+31·12	+ 7·49
	333	q			·36927	22 45·73	44 8·29	+5·639	+5·317	+31·12	+ 7·49
	334	t			·37731	22 39·63	44 7·46	+5·285	+5·294	+31·12	+ 7·57
VII$_{24}$	335–6	t	July 19..... (3)	A	·61867	295 19 36·74	− 4 43 42·88	−6·837	+5·416	+31·15	+ 7·60
	337–8	q			·62843	19 29·36	43 41·90	−7·170	+5·451	+31·16	+ 7·52
	339–40	q			·63552	19 23·99	43 41·20	−7·393	+5·478	+31·16	+ 7·52
	341–2	t			·64201	19 19·08	43 40·55	−7·589	+5·505	+31·15	+ 7·60
VIII$_{13}$	359	q	July 20..... (2)	A	·37871	295 10 2·48	− 4 42 31·56	+5·069	+5·284	+31·25	+ 7·59
	360	q			·38243	9 59·67	42 31·24	+4·902	+5·275	+31·25	+ 7·59
	361	q			·38602	9 56·97	42 30·92	+4·734	+5·265	+31·25	+ 7·60
	362	q			·39077	9 53·39	42 30·50	+4·507	+5·255	+31·25	+ 7·60
	363	q			·39633	9 49·20	42 30·02	+4·234	+5·241	+31·25	+ 7·60
	364	q			·40008	9 46·38	42 29·70	+4·050	+5·233	+31·25	+ 7·60
	365	q			·40363	9 43·71	42 29·39	+3·873	+5·226	+31·25	+ 7·60
	366	q			·40677	9 41·34	42 29·12	+3·714	+5·218	+31·25	+ 7·60
VIII$_{14}$	367	q	July 20..... (2)	G	·60458	295 7 12·39	− 4 42 12·17	−6·436	+5·380	+31·28	+ 7·62
	368	q			·60933	7 8·81	42 11·77	−6·612	+5·397	+31·28	+ 7·62
	369	q			·61493	7 4·60	42 11·30	−6·818	+5·416	+31·28	+ 7·62
	370	q			·61995	7 0·82	42 10·88	−6·995	+5·433	+31·28	+ 7·62
VIII$_{15}$	385	q	July 21..... (1)	G	·34741	294 57 55·07	− 4 41 14·14	+6·267	+5·366	+31·36	+ 7·69
	386	q			·35369	57 50·38	41 13·69	+6·014	+5·347	+31·36	+ 7·69
	387	q			·36031	57 45·42	41 13·21	+5·735	+5·326	+31·36	+ 7·69
	388	q			·36508	57 41·86	41 12·87	+5·530	+5·312	+31·36	+ 7·69

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
308	t	652	19 5	− 52	271 18 13	13 57	+ 4 16	+ 0·809	+ 0·023	+ 1·000	+ 0·552
309	t	655	21 16	− 49	271 20 27	15 37	+ 4 50	+ 0·921	+ 0·023	+ 1·000	+ 0·550
310	t	658	24 34	− 45	271 23 49	17 42	+ 6 7	+ 0·171	+ 0·024	+ 1·000	+ 0·550
311	t	660	23 9	− 44	271 22 25	19 6	+ 3 19	+ 0·637	+ 0·024	+ 1·000	+ 0·548
317	t	880	7 1	+ 79	273 8 20	4 43	+ 3 37	+ 0·926	+ 0·055	+ 0·999	+ 0·505
318	t	885	8 58	+ 79	273 10 17	6 32	+ 3 45	+ 0·965	+ 0·055	+ 0·998	+ 0·507
331	t	1416	10 16	− 48	275 9 28	7 3	+ 2 25	+ 0·996	+ 0·090	+ 0·996	+ 0·590
332	q	1893	12 9	− 39	84 11 30	12 2	− 0 32	− 0·294	+ 0·101	− 0·995	− 0·472
333	q	1889	9 31	− 35	84 8 56	10 5	− 1 9	− 0·632	+ 0·102	− 0·995	− 0·472
334	t	1434	11 28	− 32	275 10 56	8 35	+ 2 21	+ 0·980	+ 0·090	+ 0·996	+ 0·574
335–6	t	1630	24 6	+ 60	275 25 6	23 41	+ 1 25	+ 0·672	+ 0·094	+ 0·996	+ 0·476
337–8	q	1685	30 29	+ 81	82 31 50	33 4	− 1 14	− 0·605	+ 0·130	− 0·991	− 0·633
339–40	q	1679	27 11	+ 94	82 28 45	30 6	− 1 21	− 0·659	+ 0·131	− 0·991	− 0·639
341–2	t	1648	24 59	+ 95	275 26 34	25 6	+ 1 28	+ 0·703	+ 0·095	+ 0·995	+ 0·476
359	q	1154	29 14	− 27	75 28 47	31 30	− 2 43	− 0·912	+ 0·251	− 0·968	− 0·384
360	q	1151	26 32	− 26	75 26 6	28 22	− 2 16	− 0·759	+ 0·252	− 0·968	− 0·388
361	q	1149	23 54	− 24	75 23 30	25 21	− 1 51	− 0·618	+ 0·252	− 0·968	− 0·391
362	q	1145	18 17	− 23	75 17 54	21 18	− 3 24	− 1·132	+ 0·254	− 0·967	− 0·395
363	q	1141	14 37	− 21	75 14 16	16 33	− 2 17	− 0·758	+ 0·255	− 0·967	− 0·399
364	q	1138	11 32	− 20	75 11 12	13 21	− 2 9	− 0·712	+ 0·256	− 0·967	− 0·402
365	q	1135	7 46	− 19	75 7 27	10 15	− 2 48	− 0·925	+ 0·257	− 0·966	− 0·406
366	q	1133	5 33	− 19	75 5 14	7 32	− 2 18	− 0·758	+ 0·257	− 0·966	− 0·409
367	q	986	43 39	+ 49	71 44 28	47 52	− 3 24	− 0·975	+ 0·313	− 0·950	− 0·712
368	q	982	39 8	+ 54	71 40 2	42 24	− 2 22	− 0·676	+ 0·315	− 0·949	− 0·719
369	q	978	32 1	+ 61	71 33 2	35 54	− 2 52	− 0·816	+ 0·316	− 0·949	− 0·729
370	q	975	25 44	+ 68	71 26 52	30 4	− 3 12	− 0·908	+ 0·318	− 0·948	− 0·737
385	q	537	3 8	− 1	47 3 7	5 46	− 2 39	− 0·414	+ 0·681	− 0·732	+ 0·033
386	q	534	39 23	− 2	46 39 21	42 7	− 2 46	− 0·430	+ 0·686	− 0·727	+ 0·022
387	q	531	12 38	− 3	46 12 35	16 48	− 4 13	− 0·651	+ 0·692	− 0·722	+ 0·011
388	q	528	54 38	− 4	45 54 34	58 24	− 3 50	− 0·589	+ 0·696	− 0·718	+ 0·003

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VIII_{16}	390	q	July 21.....	A	.59502	294 54 50·09	− 4 40 56·77	−6·188	+5·361	+31·39	+ 7·72
	391	q			·59846	54 47·52	40 56·54	−6·325	+5·372	+31·39	+ 7·72
	392	q			·60329	54 43·92	40 56·21	−6·511	+5·387	+31·39	+ 7·72
	393	q			·60609	54 41·83	40 56·02	−6·614	+5·396	+31·39	+ 7·72
	396	q	(2)		·62665	54 26·49	40 54·62	−7·319	+5·470	+31·39	+ 7·72
	397	q			·62887	54 24·84	40 54·47	−7·387	+5·479	+31·39	+ 7·72
	398	q			·63305	54 21·72	40 54·19	−7·513	+5·495	+31·39	+ 7·72
	399	q			·63650	54 19·15	40 53·95	−7·613	+5·509	+31·39	+ 7·72
VIII_{17a}	404	q	July 22.....	A	·30098	294 46 5·21	− 4 40 12·55	+7·711	+5·519	+31·46	+ 7·78
	405	q			·30489	46 2·32	40 12·32	+7·602	+5·504	+31·46	+ 7·78
	406	q			·30906	45 59·23	40 12·09	+7·478	+5·488	+31·46	+ 7·78
	407	q			.31276	45 56·48	40 11·88	+7·367	+5·475	+31·46	+ 7·78
	408	q	(2)		·31697	45 53·36	40 11·64	+7·259	+5·460	+31·46	+ 7·78
	409	q			·31976	45 51·30	40 11·48	+7·143	+5·449	+31·46	+ 7·78
	410	q			·32323	45 48·73	40 11·28	+7·029	+5·435	+31·46	+ 7·78
	411	q			·32610	45 46·60	40 11·12	+6·926	+5·425	+31·46	+ 7·78
VIII_{17b}	417	q	July 22.....	G	·60584	294 42 19·75	− 4 39 55·89	−6·720	+5·406	+31·49	+ 7·81
	418	q	(2)		·61143	42 15·62	39 55·59	−6·923	+5·425	+31·49	+ 7·81
IX_{10}	432	r	July 23.....	G	·37770	294 32 52·65	− 4 39 20·20	+4·648	+5·256	+31·50	+ 7·95
	433	n			·38850	32 44·76	39 19·77	+4·128	+5·231	+31·64	+ 7·74
	434	n	(1)		·39875	32 37·27	39 19·36	+3·613	+5·212	+31·64	+ 7·74
	435	r			·40832	32 30·27	39 18·98	+3·120	+5·194	+31·51	+ 7·95
IX_{11}	436	p	July 23.....	A	·58239	294 30 23·22	− 4 39 12·31	−5·933	+5·336	+31·55	+ 7·83
	437	p			·58612	30 20·50	39 12·17	−6·086	+5·347	+31·55	+ 7·83
	438	q			·59197	30 16·24	39 11·95	−6·316	+5·365	+31·59	+ 7·90
	439	q			·59680	30 12·71	39 11·78	−6·501	+5·381	+31·59	+ 7·90
	444	p	(2)		·62069	29 55·30	39 10·89	−7·325	+5·465	+31·56	+ 7·83
	445	p			·62395	29 52·92	39 10·77	−7·426	+5·479	+31·56	+ 7·83
	448	q			·63714	29 43·31	39 10·31	−7·796	+5·527	+31·59	+ 7·91
	449	q			·63991	29 41·29	39 10·21	−7·867	+5·540	+31·59	+ 7·91
IX_{12}	460	p	July 24.....	G	·58135	294 18 20·31	− 4 38 42·99	−6·015	+5·335	+31·64	+ 7·92
	461	q			·59102	18 13·36	38 42·80	−6·399	+5·366	+31·69	+ 8·00
	462	q	(1)		·60086	18 6·30	38 42·59	−6·763	+5·400	+31·69	+ 8·00
	463	p			·61060	17 59·31	38 42·39	−7·098	+5·433	+31·65	+ 7·93

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
390	q	431	8 57	— 16	27 8 41	11 40	— 2 59	— 0·374	+ 0·890	— 0·456	— 0·793
391	q	430	50 23	— 17	26 50 6	51 34	— 1 28	— 0·184	+ 0·892	— 0·451	— 0·805
392	q	428	21 26	— 18	26 21 8	23 20	— 2 12	— 0·274	+ 0·896	— 0·444	— 0·820
393	q	428	1 29	— 19	26 1 10	6 55	— 5 45	— 0·716	+ 0·899	— 0·439	— 0·829
396	q	422	0 31	— 30	24 0 1	4 41	— 4 40	— 0·573	+ 0·914	— 0·407	— 0·890
397	q	422	47 19	— 31	23 46 48	51 23	— 4 35	— 0·563	+ 0·915	— 0·403	— 0·895
398	q	421	23 3	— 35	23 22 28	26 16	— 3 48	— 0·465	+ 0·918	— 0·397	— 0·905
399	q	420	3 36	— 39	23 2 57	5 28	— 2 31	— 0·308	+ 0·920	— 0·392	— 0·914
404	q	530	40 27	— 9	323 40 18	50 42	—10 24	[—*1·604]	+ 0·806	+ 0·592	+ 0·946
405	q	531	37 10	— 8	323 37 2	35 53	+ 1 9	[+ 0·178]	+ 0·806	+ 0·593	+ 0·936
406	q	534	22 0	— 7	323 21 53	20 8	+ 1 45	+ 0·272	+ 0·802	+ 0·597	+ 0·926
407	q	535	9 19	— 7	323 9 12	6 14	+ 2 58	+ 0·462	+ 0·800	+ 0·600	+ 0·917
408	q	538	53 13	— 6	322 53 7	50 36	+ 2 31	+ 0·394	+ 0·797	+ 0·603	+ 0·906
409	q	539	40 17	— 5	322 40 12	40 8	+ 0 4	+ 0·010	+ 0·795	+ 0·606	+ 0·896
410	q	541	29 33	— 5	322 29 28	27 22	+ 2 6	+ 0·331	+ 0·793	+ 0·609	+ 0·887
411	q	542	19 19	— 4	322 19 15	16 47	+ 2 28	+ 0·389	+ 0·791	+ 0·611	+ 0·879
417	q	708	52 2	+ 6	308 52 8	50 27	+ 1 41	+ 0·347	+ 0·628	+ 0·779	± 0·000
418	q	712	40 52	+ 5	308 40 57	38 34	+ 2 23	+ 0·494	+ 0·625	+ 0·781	— 0·007
432	r	3636	18 53	— 5	224 18 48	17 52	+ 0 56	+ 0·987	— 0·715	+ 0·699	+ 0·036
433	n	5020	24 3	— 5	41 23 58	24 28	— 0 30	— 0·730	+ 0·750	— 0·661	— 0·037
434	n	5015	20 17	— 6	41 20 11	20 12	— 0 1	— 0·024	+ 0·751	— 0·660	— 0·074
435	r	3652	35 29	— 8	224 35 21	34 41	+ 0 40	+ 0·708	— 0·712	+ 0·702	+ 0·142
436	p	1880	47 49	+ 37	101 48 26	49 59	— 1 33	— 0·848	— 0·205	— 0·979	— 0·402
437	p	1877	47 40	+ 39	101 48 19	50 48	— 2 29	— 1·356	— 0·205	— 0·979	— 0·400
438	q	1363	59 3	+ 33	290 59 36	58 50	+ 0 46	+ 0·304	+ 0·358	+ 0·934	+ 0·276
439	q	1366	57 10	+ 35	290 57 45	55 55	+ 1 50	+ 0·729	+ 0·358	+ 0·934	+ 0·270
444	p	1851	55 40	+ 71	101 56 51	58 18	— 1 27	— 0·781	— 0·207	— 0·978	— 0·384
445	p	1848	56 30	+ 75	101 57 45	59 1	— 1 16	— 0·681	— 0·207	— 0·978	— 0·383
448	q	1395	33 35	+ 68	290 34 43	32 41	+ 2 2	+ 0·825	+ 0·352	+ 0·936	+ 0·244
449	q	1397	31 57	+ 73	290 33 10	31 9	+ 2 1	+ 0·820	+ 0·351	+ 0·936	+ 0·243
460	p	1174	36 28	+ 34	107 37 2	39 31	— 2 29	— 0·848	— 0·303	— 0·953	— 0·327
461	q	2059	32 41	+ 41	284 33 22	32 29	+ 0 53	+ 0·529	+ 0·251	+ 0·968	+ 0·360
462	q	2066	30 41	+ 48	284 31 29	29 47	+ 1 42	+ 1·022	+ 0·251	+ 0·968	+ 0·354
463	p	1153	54 15	+ 52	107 55 7	57 30	— 2 23	— 0·799	— 0·308	— 0·952	— 0·299

*VIII_{17a} The observation 404 has probably been read 10′ in error in position-angle. It is considered safest to reject this observation, and, consequently, also the corresponding observation 405 made in the reverse position of the prism; thus only the last six observations are employed.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
X_9	468	p	July 25.....	G	·28738	294 9 56·29	− 4 38 31·53	+7·780	+5·518	+31·70	+ 7·99
	469	p			·29079	9 53·87	38 31·49	+7·692	+5·504	+31·70	+ 7·99
	470	p			·29473	9 51·08	38 31·45	+7·580	+5·489	+31·70	+ 7·99
	471	p			·30072	9 46·83	38 31·38	+7·406	+5·465	+31·70	+ 7·99
	473	p	(1)		·31783	9 34·70	38 31·20	+6·847	+5·402	+31·70	+ 7·99
	474	p			·32356	9 30·64	38 31·13	+6·642	+5·384	+31·70	+ 7·99
	475	p			·32937	9 26·52	38 31·08	+6·425	+5·364	+31·70	+ 7·99
	476	p			·33999	9 18·99	38 30·98	+6·009	+5·331	+31·70	+ 7·99
X_{10}	486	p	July 25.....	A	·58198	294 6 27·84	− 4 38 28·98	−6·165	+5·341	+31·72	+ 8·01
	487	p			·58432	6 26·19	38 28·96	−6·256	+5·348	+31·72	+ 8·01
	488	p	(3)		·58844	6 23·28	38 28·94	−6·414	+5·361	+31·72	+ 8·02
	489	p			·59274	6 20·25	38 28·91	−6·575	+5·374	+31·72	+ 8·02
X_{11}	494	p	July 26.....	A	·28022	293 58 18·42	− 4 38 28·15	+7·866	+5·523	+31·78	+ 8·08
	495	p			·28489	58 15·17	38 28·17	+7·748	+5·505	+31·78	+ 8·08
	496	p	(1)		·28845	58 12·70	38 28·18	+7·652	+5·492	+31·78	+ 8·08
	497	p			·29095	58 10·96	38 28·19	+7·583	+5·482	+31·78	+ 8·08
X_{12}	517	p	July 27.....	G	·33623	293 46 11·63	− 4 38 40·68	+5·874	+5·305	+31·85	+ 8·16
	518	p			·33947	46 9·43	38 40·74	+5·737	+5·295	+31·85	+ 8·16
	519	p	(1)		·34327	46 6·84	38 40·82	+5·577	+5·283	+31·85	+ 8·16
	520	p			·34720	46 4·17	38 40·90	+5·411	+5·271	+31·85	+ 8·16
X_{13}	522	p	July 27.....	A	·55236	293 43 45·02	− 4 38 45·27	−5·168	+5·253	+31·87	+ 8·18
	523	p			·55656	43 42·17	38 45·37	−5·353	+5·265	+31·87	+ 8·18
	524	p	(2)		·56187	43 38·58	38 45·49	−5·581	+5·281	+31·87	+ 8·18
	525	p			·56541	43 36·18	38 45·57	−5·729	+5·290	+31·87	+ 8·18
XI_{18}	540	p	July 28.....	A	·31559	293 35 13·29	− 4 39 6·89	+6·539	+5·346	+31·92	+ 8·25
	541	p			·31881	35 11·15	39 7·00	+6·418	+5·335	+31·92	+ 8·25
	542	m			·32362	35 7·95	39 7·16	+6·237	+5·320	+31·89	+ 8·13
	543	m			·32691	35 5·77	39 7·27	+6·105	+5·309	+31·89	+ 8·13
	544	m	(1)		·33153	35 2·70	39 7·43	+5·920	+5·295	+31·89	+ 8·13
	545	m			·33596	34 59·76	39 7·58	+5·736	+5·282	+31·89	+ 8·13
	546	p			·34252	34 55·40	39 7·80	+5·458	+5·263	+31·92	+ 8·25
	547	p			·34606	34 53·05	39 7·92	+5·305	+5·253	+31·92	+ 8·25
XI_{19}	548	p	July 28.....	G	·54555	293 32 41·04	− 4 39 15·04	−4·995	+5·233	+31·93	+ 8·27
	549	p			·55659	32 33·76	39 15·45	−5·481	+5·262	+31·93	+ 8·27
	550	m			·56909	32 25·50	39 15·91	−6·003	+5·299	+31·90	+ 8·15
	551	m	(3)		·57754	32 19·93	39 16·22	−6·336	+5·326	+31·90	+ 8·15
	556	m			·63471	31 42·26	39 18·40	−8·058	+5·537	+31·90	+ 8·15
	557	p			·64446	31 35·84	39 18·77	−8·253	+5·576	+31·94	+ 8·28

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
468	p	718	39 6	—105	118 37 21	40 18	— 2 57	— 0·616	— 0·479	— 0·878	— 0·857
469	p	716	44 47	— 95	118 43 12	45 58	— 2 46	— 0·576	— 0·480	— 0·877	— 0·850
470	p	714	50 47	— 85	118 49 22	52 33	— 3 11	— 0·661	— 0·482	— 0·876	— 0·846
471	p	710	0 17	— 73	118 59 4	62 38	— 3 34	— 0·737	— 0·485	— 0·875	— 0·838
473	p	699	29 27	— 47	119 28 40	32 23	— 3 43	— 0·756	— 0·492	— 0·871	— 0·806
474	p	695	39 5	— 41	119 38 24	42 33	— 4 9	— 0·839	— 0·494	— 0·869	— 0·795
475	p	691	49 53	— 36	119 49 17	53 4	— 3 47	— 0·761	— 0·497	— 0·868	— 0·784
476	p	684	8 42	— 27	120 8 15	12 36	— 4 21	— 0·866	— 0·502	— 0·865	— 0·761
486	p	535	53 36	+ 6	129 53 42	57 29	— 3 47	— 0·587	— 0·641	— 0·767	— 0·015
487	p	532	1 29	+ 6	130 1 35	4 32	— 2 57	— 0·457	— 0·643	— 0·766	— 0·009
488	p	529	14 15	+ 4	130 14 19	17 8	— 2 49	— 0·434	— 0·646	— 0·763	+ 0·004
489	p	526	24 46	+ 3	130 24 49	30 27	— 5 38	— 0·862	— 0·648	— 0·761	+ 0·016
494	p	348	50 52	+128	190 53 0	50 34	+ 2 26	+ 0·246	— 0·982	+ 0·189	— 0·666
495	p	348	20 7	+113	191 22 0	23 5	— 1 5	— 0·110	— 0·980	+ 0·197	— 0·649
496	p	349	53 36	+103	191 55 19	47 46	+ 7 33	+ 0·767	— 0·978	+ 0·206	— 0·633
497	p	349	7 49	+ 96	192 9 25	5 7	+ 4 18	+ 0·437	— 0·978	+ 0·210	— 0·624
517	p	867	56 50	— 27	245 56 23	54 14	+ 2 9	+ 0·542	— 0·408	+ 0·913	+ 0·245
518	p	870	1 16	— 26	245 60 50	57 43	+ 3 7	+ 0·789	— 0·406	+ 0·914	+ 0·252
519	p	872	5 42	— 25	246 5 17	1 46	+ 3 31	+ 0·892	— 0·405	+ 0·914	+ 0·257
520	p	875	9 35	— 24	246 9 11	5 58	+ 3 13	+ 0·819	— 0·404	+ 0·915	+ 0·264
522	p	1015	17 19	+ 24	249 17 43	17 18	+ 0 25	+ 0·123	— 0·353	+ 0·935	+ 0·673
523	p	1017	22 56	+ 26	249 23 22	20 39	+ 2 43	+ 0·804	— 0·352	+ 0·936	+ 0·681
524	p	1021	25 32	+ 29	249 26 1	24 50	+ 1 11	+ 0·352	— 0·351	+ 0·936	+ 0·689
525	p	1023	30 30	+ 32	249 31 2	27 37	+ 3 25	+ 1·017	— 0·350	+ 0·937	+ 0·696
540	p	1497	19 15	— 45	255 18 30	16 29	+ 2 1	+ 0·878	— 0·254	+ 0·967	+ 0·352
541	p	1499	20 16	— 43	255 19 33	17 32	+ 2 1	+ 0·880	— 0·253	+ 0·967	+ 0·355
542	m	2333	5 11	— 31	68 4 40	6 14	— 1 34	— 1·063	+ 0·374	— 0·928	— 0·261
543	m	2331	4 20	— 30	68 3 50	5 7	— 1 17	— 0·870	+ 0·374	— 0·928	— 0·265
544	m	2328	3 0	— 28	68 2 32	3 34	— 1 2	— 0·700	+ 0·374	— 0·927	— 0·270
545	m	2325	1 18	— 27	68 0 51	2 5	— 1 14	— 0·834	+ 0·374	— 0·927	— 0·275
546	p	1515	28 28	— 31	255 27 57	25 11	+ 2 46	+ 1·219	— 0·251	+ 0·968	+ 0·372
547	p	1518	28 48	— 29	255 28 19	26 20	+ 1 59	+ 0·876	— 0·251	+ 0·968	+ 0·375
548	p	1657	25 21	+ 25	256 25 46	25 57	— 0 11	— 0·088	— 0·235	+ 0·972	+ 0·625
549	p	1665	30 1	+ 32	256 30 33	28 56	+ 1 37	+ 0·783	— 0·233	+ 0·972	+ 0·638
550	m	2169	34 18	+ 35	66 34 53	36 15	— 1 22	— 0·862	+ 0·397	— 0·918	— 0·724
551	m	2164	30 57	+ 43	66 31 40	32 56	— 1 16	— 0·798	+ 0·398	— 0·917	— 0·741
556	m	2127	6 39	+174	66 9 33	10 36	— 1 3	— 0·650	+ 0·404	— 0·915	— 0·832
557	p	1724	48 59	+251	256 53 10	51 19	+ 1 51	+ 0·928	— 0·227	+ 0·974	+ 0·729

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XI_{20}	568	m	July 31.....	A	·55491	293 0 59·40	− 4 42 9·03	−5·772	+5·238	+32·03	+ 8·39
	569	m	(2)		·55810	0 57·48	42 9·28	−5·900	+5·247	+32·03	+ 8·39
	570	m			·56522	0 53·19	42 9·84	−6·185	+5·269	+32·03	+ 8·39
	571	m			·57068	0 49·91	42 10·26	−6·391	+5·287	+32·03	+ 8·39
XI_{21}	576	k	Aug. 1	A	·27225	292 53 53·29	− 4 43 8·33	+7·455	+5·393	+31·99	+ 8·45
	577	k			·27561	53 51·32	43 8·62	+7·358	+5·380	+31·99	+ 8·45
	578	m			·28007	53 48·71	43 9·01	+7·228	+5·361	+32·05	+ 8·44
	579	m	(1)		·28329	53 46·82	43 9·29	+7·129	+5·349	+32·05	+ 8·44
	580	m			·28716	53 44·55	43 9·63	+7·006	+5·335	+32·05	+ 8·44
	581	m			·29737	53 38·57	43 10·53	+6·664	+5·299	+32·05	+ 8·44
	582	k			·30036	53 36·82	43 10·79	+6·558	+5·289	+32·00	+ 8·45
	583	k			·30302	53 35·26	43 11·03	+6·459	+5·280	+32·00	+ 8·45
XI_{22}	588	k	Aug. 1	G	·52597	292 51 25·27	− 4 43 30·89	−4·636	+5·148	+32·00	+ 8·47
	589	m	(1)		·53249	51 21·48	43 31·47	−4·931	+5·164	+32·06	+ 8·46
	590	m			·53698	51 18·87	43 31·89	−5·132	+5·178	+32·06	+ 8·46
	591	k			·54288	51 15·45	43 32·43	−5·386	+5·192	+32·00	+ 8·47
XI_{23}	600	k	Aug. 2	G	·32402	292 43 49·17	− 4 44 47·20	+5·491	+5·185	+32·02	+ 8·53
	601	i	(1)		·32926	43 46·22	44 47·73	+5·266	+5·170	+32·07	+ 8·48
	602	i			·33424	43 43·42	44 48·23	+5·049	+5·157	+32·07	+ 8·48
	603	k			·34201	43 39·05	44 49·02	+4·700	+5·137	+32·02	+ 8·53
XII_{16}	608	g	Aug. 5	A	·26406	292 18 1·09	− 4 50 34·29	+7·229	+5·291	+32·00	+ 8·66
	609	g			·26661	17 59·84	50 34·63	+7·154	+5·280	+32·00	+ 8·66
	610	g			·26966	17 58·35	50 35·05	+7·062	+5·270	+32·00	+ 8·66
	611	g			·27254	17 56·94	50 35·43	+6·974	+5·258	+32·00	+ 8·66
	612	g	(1)		·27644	17 55·03	50 35·96	+6·849	+5·243	+32·00	+ 8·66
	613	g			·27896	17 53·80	50 36·30	+6·769	+5·234	+32·00	+ 8·66
	614	g			·28129	17 52·66	50 36·62	+6·691	+5·226	+32·00	+ 8·66
	615	g			·28411	17 51·28	50 37·00	+6·594	+5·215	+32·00	+ 8·66
XII_{17}	635	f	Aug. 6	G	·31757	292 9 40·16	− 4 53 2·41	+5·154	+5·075	+32·01	+ 8·68
	636	f			·32163	9 38·29	53 3·00	+4·979	+5·064	+32·01	+ 8·68
	637	f	(1)		·32739	9 35·63	53 3·84	+4·724	+5·049	+32·01	+ 8·68
	638	f			·33317	9 32·97	53 4·69	+4·464	+5·035	+32·01	+ 8·68

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O-C.	O-C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
568	m	697	9 27	− 29	9 8 58	11 10	− 2 12	− 0·446	+ 0·987	− 0·159	− 0·651
569	m	696	1 38	− 31	9 1 7	1 24	− 0 17	− 0·057	+ 0·988	− 0·157	− 0·663
570	m	695	38 57	− 35	8 38 22	39 34	− 1 12	− 0·243	+ 0·989	− 0·150	− 0·689
571	m	694	22 13	− 39	8 21 34	22 50	− 1 16	− 0·256	+ 0·989	− 0·145	− 0·707
576	k	873	58 27	− 35	135 57 52	60 56	− 3 4	− 0·779	− 0·719	− 0·695	− 0·910
577	k	872	7 12	− 31	136 6 41	7 37	− 0 56	− 0·237	− 0·721	− 0·693	− 0·902
578	m	698	7 39	+ 25	334 8 4	5 34	+ 2 30	+ 0·508	+ 0·900	+ 0·436	+ 0·882
579	m	699	56 33	+ 24	333 56 57	56 10	+ 0 47	+ 0·159	+ 0·899	+ 0·438	+ 0·873
580	m	699	44 4	+ 22	333 44 26	44 54	− 0 28	− 0·095	+ 0·897	+ 0·443	+ 0·863
581	m	701	18 12	+ 19	333 18 31	15 8	+ 3 23	+ 0·690	+ 0·893	+ 0·449	+ 0·831
582	k	863	55 53	− 12	136 55 41	57 40	− 1 59	− 0·498	− 0·730	− 0·683	− 0·839
583	k	862	2 10	− 11	137 1 59	3 10	− 1 11	− 0·297	− 0·732	− 0·682	− 0·832
588	k	789	32 13	− 3	145 32 10	32 48	− 0 38	− 0·145	− 0·824	− 0·566	+ 0·090
589	m	763	34 49	− 2	322 34 47	32 6	+ 2 41	+ 0·596	+ 0·794	+ 0·608	− 0·076
590	m	764	23 59	− 3	322 23 56	21 0	+ 2 56	+ 0·652	+ 0·792	+ 0·610	− 0·089
591	k	785	13 42	− 9	146 13 33	14 35	− 1 2	− 0·236	− 0·831	− 0·556	+ 0·158
600	k	727	50 42	+ 29	179 51 11	50 43	+ 0 28	+ 0·099	− 1·000	− 0·003	− 0·549
601	i	988	33 57	+ 24	10 34 21	35 49	− 1 28	− 0·422	+ 0·983	− 0·183	+ 0·421
602	i	987	24 36	+ 22	10 24 58	25 51	− 0 53	− 0·254	+ 0·984	− 0·181	+ 0·402
603	k	729	42 51	+ 21	180 43 12	42 1	+ 1 11	+ 0·251	− 1·000	+ 0·013	− 0·462
608	g	740	27 20	− 23	138 26 57	30 8	− 3 11	− 0·685	− 0·748	− 0·663	− 0·890
609	g	740	33 30	− 21	138 33 9	35 50	− 2 41	− 0·578	− 0·750	− 0·662	− 0·884
610	g	739	40 25	− 18	138 40 7	42 39	− 2 32	− 0·545	− 0·751	− 0·660	− 0·876
611	g	738	46 0	− 17	138 45 43	49 5	− 3 22	− 0·723	− 0·752	− 0·659	− 0·869
612	g	737	56 0	− 14	138 55 46	57 52	− 2 6	− 0·450	− 0·754	− 0·657	− 0·858
613	g	737	0 31	− 12	139 0 19	3 32	− 3 13	− 0·690	− 0·755	− 0·656	− 0·852
614	g	736	7 6	− 11	139 6 55	8 48	− 1 53	− 0·403	− 0·756	− 0·655	− 0·847
615	g	735	14 4	− 10	139 13 54	15 13	− 1 19	− 0·282	− 0·757	− 0·653	− 0·833
635	f	773	37 32	− 21	63 37 11	40 43	− 3 32	− 0·795	+ 0·444	− 0·896	− 0·227
636	f	771	35 2	− 21	63 34 41	39 8	− 4 27	− 0·998	+ 0·445	− 0·895	− 0·232
637	f	768	31 51	− 20	63 31 31	36 46	− 5 15	− 1·173	+ 0·446	− 0·895	− 0·242
638	f	765	30 9	− 19	63 29 50	34 25	− 4 35	− 1·020	+ 0·446	− 0·895	− 0·253

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XII18	640	f	Aug. 6	A	·51998	292 8 7·31	− 4 53 32·22	−4·983	+5·060	+32·01	+ 8·69
	641	f			·52319	8 5·84	53 32·70	−5·120	+5·068	+32·01	+ 8·69
	642	f			·52629	8 4·43	53 33·16	−5·252	+5·076	+32·01	+ 8·69
	643	f			·52953	8 2·95	53 33·63	−5·386	+5·085	+32·01	+ 8·69
	644	f	(1)		·53344	8 1·17	53 34·21	−5·547	+5·098	+32·01	+ 8·69
	645	f			·53660	7 59·73	53 34·68	−5·677	+5·108	+32·01	+ 8·69
	646	f			·54008	7 58·14	53 35·20	−5·813	+5·119	+32·01	+ 8·69
	647	f			·54392	7 56·39	53 35·77	−5·961	+5·129	+32·01	+ 8·69
XII19	669	f	Aug. 7	A	·29180	292 2 23·53	− 4 55 29·79	+6·047	+5·117	+32·00	+ 8·74
	670	f			·29535	2 21·99	55 30·34	+5·911	+5·106	+32·00	+ 8·74
	671	f	(1)		·29927	2 20·28	55 30·96	+5·759	+5·094	+32·00	+ 8·74
	672	f			·30195	2 19·12	55 31·37	+5·653	+5·085	+32·00	+ 8·74
XII20	677	f	Aug. 7.....	G	·55100	292 0 31·75	− 4 56 10·63	−6·310	+5·134	+31·99	+ 8·76
	678	f			·56218	0 26·97	56 12·41	−6·693	+5·175	+31·99	+ 8·76
	679	f			·57073	0 23·32	56 13·77	−6·963	+5·205	+31·99	+ 8·76
	680	f			·57633	0 20·93	56 14·66	−7·130	+5·227	+31·99	+ 8·76
	681	f	(1)		·58248	0 18·31	56 15·64	−7·300	+5·250	+31·99	+ 8·76
	682	f			·58649	0 16·59	56 16·28	−7·407	+5·267	+31·99	+ 8·76
	683	f			·59098	0 14·68	56 16·99	−7·519	+5·285	+31·99	+ 8·76
	684	f			·59507	0 12·93	56 17·64	−7·615	+5·302	+31·99	+ 8·76
XII21	691	f	Aug. 8.....	G	·28527	291 55 25·31	− 4 58 9·94	+6·148	+5·103	+31·97	+ 8·80
	692	f			·29100	55 22·98	58 10·89	+5·936	+5·083	+31·97	+ 8·80
	693	f			·29668	55 20·66	58 11·84	+5·717	+5·065	+31·97	+ 8·80
	694	f			·30102	55 18·90	58 12·56	+5·542	+5·051	+31·97	+ 8·80
	695	f	(1)		·30544	55 17·10	58 13·29	+5·363	+5·039	+31·97	+ 8·80
	696	f			·30839	55 15·90	58 13·78	+5·242	+5·030	+31·97	+ 8·80
	697	f			·31181	55 14·51	58 14·35	+5·096	+5·020	+31·97	+ 8·80
	698	f			·31504	55 13·20	58 14·88	+4·960	+5·011	+31·97	+ 8·80
XII22	701	f	Aug. 8.....	A	·52456	291 53 48·71	− 4 58 49·94	−5·389	+5·034	+31·96	+ 8·82
	702	f			·53238	53 45·59	58 51·26	−5·701	+5·059	+31·96	+ 8·82
	703	f			·53773	53 43·45	58 52·16	−5·908	+5·075	+31·96	+ 8·82
	704	f			·54030	53 42·42	58 52·59	−6·005	+5·083	+31·96	+ 8·82
	705	f	(2)		·54363	53 41·09	58 53·15	−6·127	+5·095	+31·96	+ 8·82
	706	f			·54652	53 39·93	58 53·64	−6·232	+5·103	+31·96	+ 8·82
	707	f			·57183	53 29·82	58 57·92	−7·055	+5·196	+31·96	+ 8·82
	708	f			·58371	53 25·08	58 59·93	−7·383	+5·242	+31·96	+ 8·82

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
640	f	669	57 55	+ 19	61 58 14	64 18	− 6 4	− 1·181	+ 0·470	− 0·883	− 0·680
641	f	667	56 26	+ 20	61 56 46	62 34	− 5 48	− 1·126	+ 0·470	− 0·883	− 0·688
642	f	665	55 41	+ 22	61 56 3	60 54	− 4 51	− 0·938	+ 0·471	− 0·882	− 0·694
643	f	664	52 59	+ 24	61 53 23	59 5	− 5 42	− 1·101	+ 0·471	− 0·882	− 0·702
644	f	662	49 52	+ 26	61 50 18	56 59	− 6 41	− 1·287	+ 0·472	− 0·882	− 0·711
645	f	660	49 43	+ 28	61 50 11	55 16	− 5 5	− 0·976	+ 0·472	− 0·882	− 0·718
646	f	658	49 10	+ 31	61 49 41	53 24	− 3 43	− 0·711	+ 0·472	− 0·882	− 0·725
647	f	656	44 44	+ 34	61 45 18	51 19	− 6 1	− 1·148	+ 0·473	− 0·881	− 0·733
669	f	325	46 38	− 10	52 46 28	57 43	−11 15	− 1·064	+ 0·605	− 0·796	− 0·044
670	f	323	37 59	− 10	52 37 49	51 45	−13 56	− 1·309	+ 0·607	− 0·795	− 0·049
671	f	321	32 12	− 10	52 32 2	45 14	−13 12	− 1·233	+ 0·608	− 0·794	− 0·055
672	f	320	30 57	− 11	52 30 46	40 31	− 9 45	− 0·908	+ 0·608	− 0·794	− 0·062
677	f	206	59 53	+ 8	41 0 1	12 40	−12 39	− 0·758	+ 0·755	− 0·656	− 0·811
678	f	201	14 25	+ 11	40 14 36	26 1	−11 25	− 0·668	+ 0·763	− 0·646	− 0·843
679	f	197	35 39	+ 14	39 35 53	49 17	−13 24	− 0·768	+ 0·771	− 0·637	− 0·866
680	f	195	10 55	+ 16	39 11 11	24 35	−13 24	− 0·760	+ 0·775	− 0·632	− 0·881
681	f	193	45 42	+ 18	38 46 0	57 8	−11 8	− 0·625	+ 0·780	− 0·626	− 0·895
682	f	191	26 58	+ 20	38 27 18	38 38	−11 20	− 0·630	+ 0·783	− 0·622	− 0·906
683	f	189	6 16	+ 21	38 6 37	17 55	−11 18	− 0·621	+ 0·787	− 0·617	− 0·916
684	f	188	39 25	+ 23	37 39 48	58 40	−18 52	− 1·032	+ 0·792	− 0·611	− 0·925
691	f	161	1 35	− 51	282 60 44	39 13	+21 31	+ 1·008	+ 0·225	+ 0·974	+ 0·634
692	f	164	30 12	− 45	282 29 27	7 40	+21 47	+ 1·039	+ 0·216	+ 0·976	+ 0·624
693	f	166	48 38	− 41	281 47 57	37 11	+10 46	+ 0·520	+ 0·205	+ 0·979	+ 0·613
694	f	168	30 42	− 37	281 30 5	14 20	+15 45	+ 0·770	+ 0·204	+ 0·979	+ 0·606
695	f	169	7 20	− 34	280 66 46	51 48	+14 58	+ 0·736	+ 0·193	+ 0·981	+ 0·597
696	f	171	48 31	− 33	280 47 58	36 54	+11 4	+ 0·551	+ 0·187	+ 0·982	+ 0·591
697	f	172	36 58	− 31	280 36 27	19 54	+16 33	+ 0·828	+ 0·184	+ 0·983	+ 0·586
698	f	173	19 5	− 29	280 18 36	4 13	+14 23	+ 0·724	+ 0·179	+ 0·984	+ 0·581
701	f	265	9 7	+ 37	269 9 44	58 17	+11 27	+ 0·873	− 0·015	+ 1·000	+ 0·511
702	f	269	55 48	+ 42	268 56 30	42 33	+13 57	+ 1·092	− 0·018	+ 1·000	+ 0·516
703	f	271	38 12	+ 46	268 38 58	32 3	+ 6 55	+ 0·545	− 0·025	+ 1·000	+ 0·523
704	f	272	35 49	+ 49	268 36 38	26 59	+ 9 39	+ 0·764	− 0·024	+ 1·000	+ 0·522
705	f	274	30 9	+ 52	268 31 1	20 42	+10 19	+ 0·822	− 0·026	+ 1·000	+ 0·526
706	f	275	26 57	+ 55	268 27 52	15 1	+12 51	+ 1·028	− 0·027	+ 1·000	+ 0·527
707	f	286	37 32	+ 91	267 39 3	28 47	+10 16	+ 0·854	− 0·041	+ 0·999	+ 0·548
708	f	291	13 24	+119	267 15 23	8 9	+ 7 14	+ 0·612	− 0·048	+ 0·999	+ 0·558

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XII$_{23}$	728	f	Aug. 9.....	A	·29530	291 48 48·73	− 5 1 2·49	+5·626	+5·031	+31·95	+ 8·88
	729	f			·29825	48 47·62	1 3·00	+5·509	+5·022	+31·95	+ 8·88
	730	f			·30103	48 46·57	1 3·49	+5·399	+5·014	+31·95	+ 8·88
	731	f			·30462	48 45·21	1 4·13	+5·250	+5·003	+31·95	+ 8·88
	732	f	(2)		·30974	48 43·27	1 5·03	+5·032	+4·988	+31·95	+ 8·88
	733	f			·31228	48 42·31	1 5·47	+4·923	+4·982	+31·95	+ 8·88
	734	f			·31513	48 41·24	1 5·98	+4·800	+4·976	+31·95	+ 8·88
	735	f			·31798	48 40·16	1 6·48	+4·675	+4·968	+31·95	+ 8·88
XIII$_{19}$	745	f	Aug. 10.....	G	·30691	291 42 41·07	− 5 4 4·68	+5·000	+4·958	+31·91	+ 8·94
	746	e			·31534	42 38·14	4 6·23	+4·640	+4·936	+31·89	+ 8·82
	747	e	(3)		·32344	42 35·32	4 7·73	+4·278	+4·916	+31·89	+ 8·82
	748	f			·33250	42 32·17	4 9·41	+3·860	+4·895	+31·91	+ 8·94
XIII$_{20}$	749	f	Aug. 10.....	A	·50416	291 41 32·87	− 5 4 41·26	−4·735	+4·936	+31·90	+ 8·95
	750	f			·50874	41 31·30	4 42·11	−4·932	+4·948	+31·90	+ 8·95
	751	e			·51446	41 29·35	4 43·18	−5·173	+4·965	+31·88	+ 8·83
	752	e			·51904	41 27·78	4 44·03	−5·360	+4·977	+31·88	+ 8·83
	753	e	(1)		·52300	41 26·42	4 44·77	−5·518	+4·989	+31·88	+ 8·83
	754	e			·52614	41 25·35	4 45·35	−5·641	+4·999	+31·88	+ 8·83
	755	f			·53053	41 23·85	4 46·17	−5·809	+5·012	+31·90	+ 8·95
	756	f			·53381	41 22·73	4 46·79	−5·932	+5·023	+31·90	+ 8·95
XIII$_{21}$	769	f	Aug. 11.....	A	·27775	291 37 16·61	− 5 7 7·94	+6·008	+5·009	+31·87	+ 8·99
	770	e			·28299	37 14·93	7 8·95	+5·813	+4·991	+31·84	+ 8·87
	771	e	(3)		·28855	37 13·15	7 10·03	+5·602	+4·974	+31·84	+ 8·87
	772	f			·30463	37 8·03	7 13·13	+4·951	+4·926	+31·87	+ 8·99
XIII$_{22}$	773	f	Aug. 11.....	G	·53076	291 35 56·66	− 5 7 57·01	−5·901	+4·993	+31·86	+ 8·99
	774	e	(3)		·54222	35 53·09	7 59·24	−6·308	+5·033	+31·83	+ 8·89
XIII$_{23}$	785	e	Aug. 14.....	G	·33379	291 23 21·68	− 5 14 1·33	+3·171	+4·737	+31·67	+ 9·03
	786	e			·33838	23 20·64	14 2·29	+2·951	+4·730	+31·67	+ 9·03
	789	e	(1)		·34978	23 18·07	14 4·68	+2·396	+4·712	+31·67	+ 9·03
	790	e			·35250	23 17·46	14 5·24	+2·260	+4·708	+31·67	+ 9·03
XIII$_{24}$	799	e	Aug. 16.....	G	·34533	291 16 51·28	− 5 25 1·83	+2·302	+4·641	+31·53	+ 9·13
	800	e			·35044	16 50·46	25 3·00	+2·051	+4·633	+31·53	+ 9·13
	801	e	(3)		·35475	16 49·77	25 3·99	+1·837	+4·628	+31·53	+ 9·13
	802	e			·36067	16 48·80	25 5·35	+1·544	+4·622	+31·53	+ 9·13

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
728	f	570	9 22	− 35	256 8 47	2 52	+ 5 55	+ 0·981	− 0·239	+ 0·971	+ 0·354
729	f	571	8 29	− 34	256 7 55	1 37	+ 6 18	+ 1·047	− 0·240	+ 0·971	+ 0·355
730	f	572	5 3	− 32	256 4 31	0 23	+ 4 8	+ 0·688	− 0·241	+ 0·971	+ 0·356
731	f	574	6 38	− 31	255 66 7	58 47	+ 7 20	+ 1·225	− 0·240	+ 0·971	+ 0·361
732	f	576	2 15	− 29	255 61 46	56 37	+ 5 9	+ 0·863	− 0·241	+ 0·970	+ 0·363
733	f	577	0 25	− 28	255 59 57	55 34	+ 4 23	+ 0·736	− 0·242	+ 0·970	+ 0·364
734	f	579	0 24	− 27	255 59 57	54 20	+ 5 37	+ 0·946	− 0·242	+ 0·970	+ 0·367
735	f	580	59 54	− 26	255 59 28	53 8	+ 6 20	+ 1·069	− 0·242	+ 0·970	+ 0·369
745	f	974	54 28	− 26	250 54 2	50 0	+ 4 2	+ 1·143	− 0·327	+ 0·945	+ 0·306
746	e	1439	14 43	− 5	45 14 38	16 56	− 2 18	− 0·963	+ 0·704	− 0·710	− 0·026
747	e	1435	11 47	− 6	45 11 41	14 11	− 2 30	− 1·044	+ 0·705	− 0·710	− 0·049
748	f	985	48 22	− 19	250 48 3	45 40	+ 2 23	+ 0·683	− 0·329	+ 0·944	+ 0·336
749	f	1059	22 23	+ 22	250 22 45	20 28	+ 2 17	+ 0·703	− 0·336	+ 0·942	+ 0·624
750	f	1061	22 41	+ 24	250 23 5	19 49	+ 3 16	+ 1·008	− 0·336	+ 0·942	+ 0·631
751	e	1357	2 26	+ 4	44 2 30	3 54	− 1 24	− 0·553	+ 0·719	− 0·695	− 0·715
752	e	1355	59 16	+ 5	43 59 21	62 11	− 2 50	− 1·116	+ 0·719	− 0·695	− 0·730
753	e	1354	58 22	+ 7	43 58 29	60 43	− 2 14	− 0·880	+ 0·720	− 0·694	− 0·742
754	e	1353	57 28	+ 8	43 57 36	59 33	− 1 57	− 0·768	+ 0·720	− 0·694	− 0·751
755	f	1070	19 29	+ 39	250 20 8	16 42	+ 3 26	+ 1·069	− 0·337	+ 0·942	+ 0·667
756	f	1072	17 46	+ 42	250 18 28	16 11	+ 2 17	+ 0·712	− 0·337	+ 0·941	+ 0·671
769	f	1340	59 24	− 32	247 58 52	57 8	+ 1 44	+ 0·676	− 0·375	+ 0·927	+ 0·239
770	e	1086	10 33	+ 7	40 10 40	13 23	− 2 43	− 0·858	+ 0·764	− 0·645	+ 0·120
771	e	1084	7 23	+ 5	40 7 28	10 50	− 3 22	− 1·062	+ 0·764	− 0·644	+ 0·106
772	f	1351	55 56	− 23	247 55 33	53 52	+ 1 41	+ 0·662	− 0·376	+ 0·927	+ 0·271
773	f	1443	30 59	+ 39	247 31 38	30 31	+ 1 7	+ 0·469	− 0·382	+ 0·924	+ 0·685
774	e	988	54 39	+ 4	37 54 43	57 46	− 3 3	− 0·877	+ 0·789	− 0·615	− 0·805
785	e	437	24 14	+ 12	327 24 26	22 51	+ 1 35	+ 0·201	+ 0·843	+ 0·539	+ 0·522
786	e	436	59 4	+ 12	326 59 16	60 8	− 0 52	− 0·110	+ 0·839	+ 0·545	+ 0·505
789	e	435	7 39	+ 10	326 7 49	3 54	+ 3 55	+ 0·496	+ 0·830	+ 0·558	+ 0·461
790	e	435	54 42	+ 10	325 54 52	50 25	+ 4 27	+ 0·563	+ 0·828	+ 0·561	+ 0·450
799	e	574	59 24	− 13	244 59 11	51 55	+ 7 16	+ 1·213	− 0·423	+ 0·906	+ 0·323
800	e	576	57 50	− 12	244 57 38	48 15	+ 9 23	+ 1·572	− 0·423	+ 0·906	+ 0·333
801	e	577	46 10	− 12	244 45 58	45 11	+ 0 47	+ 0·132	− 0·426	+ 0·905	+ 0·341
802	e	579	47 29	− 11	244 47 18	41 2	+ 6 16	+ 1·056	− 0·426	+ 0·905	+ 0·353

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XIII$_{25}$	803	e	Aug. 16.....	A	·49061	291 16 28·07	− 5 25 35·18	−4·756	+4·750	+31·52	+ 9·14
	804	e			·49388	16 27·56	25 35·92	−4·890	+4·759	+31·52	+ 9·14
	805	e			·49689	16 27·09	25 36·62	−5·009	+4·769	+31·52	+ 9·14
	806	e			·49972	16 26·65	25 37·27	−5·124	+4·777	+31·52	+ 9·14
	807	e	(3)		·50297	16 26·13	25 38·01	−5·251	+4·786	+31·52	+ 9·14
	808	e			·50544	16 25·75	25 38·59	−5·348	+4·794	+31·52	+ 9·14
	809	e			·51185	16 24·74	25 40·06	−5·587	+4·814	+31·52	+ 9·14
	810	e			·51697	16 23·94	25 41·24	−5·775	+4·831	+31·52	+ 9·14
	865	d	Aug. 22.....	G	·25184	291 10 24·33	− 5 49 4·81	+5·460	+4·613	+31·02	+ 9·26
	866	d			·25624	10 24·47	49 5·94	+5·304	+4·597	+31·02	+ 9·26
	867	d			·26144	10 24·64	49 7·28	+5·111	+4·579	+31·02	+ 9·26
	868	d			·26575	10 24·78	49 8·39	+4·950	+4·566	+31·02	+ 9·26
XV$_{12}$	869	d	(2)		·27152	10 24·97	49 9·87	+4·724	+4·550	+31·02	+ 9·26
	870	d			·27615	10 25·12	49 11·06	+4·541	+4·536	+31·02	+ 9·26
	871	d			·27997	10 25·25	49 12·04	+4·386	+4·525	+31·02	+ 9·26
	872	d			·28373	10 25·37	49 13·01	+4·233	+4·514	+31·02	+ 9·26
	879	d	Aug. 22.....	A	·48023	291 10 32·59	− 5 50 3·56	−4·834	+4·552	+30·99	+ 9·27
	880	d			·48323	10 32·71	50 4·33	−4·951	+4·559	+30·99	+ 9·27
XV$_{13}$	881	d	(2)		·48685	10 32·86	50 5·27	−5·087	+4·570	+30·99	+ 9·27
	882	d			·48968	10 32·97	50 6·00	−5·192	+4·579	+30·99	+ 9·27
	898	d	Aug. 23.....	A	·27335	291 11 14·97	− 5 53 28·86	+4·517	+4·498	+30·91	+ 9·30
	899	d			·27998	11 15·41	53 30·59	+4·251	+4·479	+30·91	+ 9·30
XV$_{14}$	900	d	(3)		·28728	11 15·90	53 32·49	+3·945	+4·460	+30·91	+ 9·30
	901	d			·29025	11 16·10	53 33·26	+3·817	+4·451	+30·91	+ 9·30
	903	d	Aug. 23.....	G	·46668	291 11 28·49	− 5 54 19·20	−4·374	+4·480	+30·89	+ 9·31
	904	d			·47209	11 28·88	54 20·60	−4·590	+4·496	+30·89	+ 9·31
XV$_{15}$	905	d	(2)		·47752	11 29·28	54 22·02	−4·803	+4·513	+30·89	+ 9·31
	906	d			·48508	11 29·84	54 23·99	−5·088	+4·536	+30·89	+ 9·31
	918	d	Aug. 24.....	A	·53469	291 13 5·89	− 5 58 59·04	−6·669	+4·700	+30·75	+ 9·34
	919	d			·53729	13 6·18	58 59·72	−6·731	+4·711	+30·75	+ 9·34
XV$_{16}$	920	d	(3)		·53978	13 6·45	59 0·38	−6·789	+4·721	+30·75	+ 9·34
	921	d			·54257	13 6·65	59 0·86	−6·852	+4·734	+30·75	+ 9·34

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
803	e	616	18 30	+ 19	243 18 49	15 20	+ 3 29	+ 0·624	− 0·449	+ 0·894	+ 0·638
804	e	617	16 55	+ 21	243 17 16	13 18	+ 3 58	+ 0·712	− 0·450	+ 0·893	+ 0·644
805	e	618	15 5	+ 22	243 15 27	11 21	+ 4 6	+ 0·737	− 0·450	+ 0·893	+ 0·650
806	e	619	12 32	+ 24	243 12 56	9 33	+ 3 23	+ 0·609	− 0·451	+ 0·893	+ 0·657
807	e	620	10 3	+ 26	243 10 29	7 33	+ 2 56	+ 0·529	− 0·451	+ 0·892	+ 0·663
808	e	620	11 51	+ 28	243 12 19	5 53	+ 6 26	+ 1·161	− 0·451	+ 0·893	+ 0·668
809	e	622	7 30	+ 32	243 8 2	1 51	+ 6 11	+ 1·119	− 0·452	+ 0·892	+ 0·680
810	e	623	0 55	+ 36	242 61 31	58 37	+ 2 54	+ 0·526	− 0·453	+ 0·891	+ 0·691
865	d	643	11 8	− 32	298 10 36	7 6	+ 3 30	+ 0·655	+ 0·472	+ 0·881	+ 0·663
866	d	643	4 5	− 29	298 3 36	1 41	+ 1 55	+ 0·359	+ 0·471	+ 0·882	+ 0·655
867	d	642	56 31	− 26	297 56 5	55 12	+ 0 53	+ 0·165	+ 0·469	+ 0·883	+ 0·643
868	d	641	49 50	− 23	297 49 27	49 51	− 0 24	− 0·075	+ 0·467	+ 0·884	+ 0·634
869	d	641	44 6	− 20	297 43 46	42 38	+ 1 8	+ 0·211	+ 0·465	+ 0·885	+ 0·622
870	d	640	40 9	− 18	297 39 51	36 51	+ 3 0	+ 0·559	+ 0·464	+ 0·886	+ 0·612
871	d	640	34 36	− 16	297 34 20	32 5	+ 2 15	+ 0·419	+ 0·463	+ 0·886	+ 0·603
872	d	639	27 47	− 15	297 27 32	27 16	+ 0 16	+ 0·050	+ 0·461	+ 0·887	+ 0·594
879	d	619	15 34	+ 23	293 15 57	13 36	+ 2 21	+ 0·423	+ 0·395	+ 0·919	+ 0·228
880	d	619	10 53	+ 24	293 11 17	9 43	+ 1 34	+ 0·282	+ 0·394	+ 0·919	+ 0·225
881	d	619	4 31	+ 25	293 4 56	5 0	− 0 4	− 0·012	+ 0·392	+ 0·919	+ 0·221
882	d	618	2 43	+ 25	293 3 8	1 20	+ 1 48	+ 0·324	+ 0·392	+ 0·920	+ 0·219
898	d	519	20 5	− 29	274 19 36	17 38	+ 1 58	+ 0·297	+ 0·076	+ 0·997	+ 0·483
899	d	519	9 28	− 25	274 9 3	6 9	+ 2 54	+ 0·438	+ 0·072	+ 0·997	+ 0·478
900	d	518	58 0	− 22	273 57 38	53 33	+ 4 5	+ 0·615	+ 0·070	+ 0·998	+ 0·473
901	d	518	51 54	− 21	273 51 33	48 25	+ 3 8	+ 0·472	+ 0·067	+ 0·998	+ 0·470
903	d	513	48 31	+ 27	268 48 58	42 52	+ 6 6	+ 0·910	− 0·021	+ 1·000	+ 0·457
904	d	513	36 28	+ 30	268 36 58	33 36	+ 3 22	+ 0·502	− 0·024	+ 1·000	+ 0·461
905	d	513	26 29	+ 33	268 27 2	24 7	+ 2 55	+ 0·435	− 0·027	+ 1·000	+ 0·464
906	d	513	14 46	+ 38	268 15 24	11 3	+ 4 21	+ 0·649	− 0·031	+ 1·000	+ 0·470
918	d	510	13 29	+ 71	235 14 40	8 52	+ 5 48	+ 0·861	− 0·570	+ 0·821	+ 0·764
919	d	510	7 10	+ 76	235 8 26	4 28	+ 3 58	+ 0·589	− 0·572	+ 0·820	+ 0·769
920	d	510	2 26	+ 81	235 3 47	0 4	+ 3 43	+ 0·552	− 0·573	+ 0·820	+ 0·774
921	d	510	0 24	+ 87	234 61 51	56 56	+ 4 55	+ 0·730	− 0·573	+ 0·819	+ 0·777

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XV_{17}	928	d	Aug. 26..... (3)	G	·29867	291 17 10·90	− 6 6 46·87	+3·041	+4·300	+30·53	+ 9·39
XV_{18}	933	d	Aug. 26.....	A	·47155	291 17 40·55	− 6 7 33·02	−4·783	+4·404	+30·51	+ 9·40
	934	d			·47776	17 41·63	7 34·67	−5·010	+4·423	+30·51	+ 9·40
	935	d			·48010	17 42·04	7 35·30	−5·095	+4·431	+30·51	+ 9·40
	936	d	(1)		·48230	17 42·43	7 35·89	−5·172	+4·438	+30·51	+ 9·40
	939	d			·50794	17 46·92	7 42·74	−6·005	+4·534	+30·50	+ 9·40
	940	d			·51107	17 47·47	7 43·58	−6·094	+4·548	+30·50	+ 9·40
	941	d			·51398	17 47·98	7 44·36	−6·177	+4·560	+30·50	+ 9·40
	942	d			·51653	17 48·43	7 45·04	−6·249	+4·570	+30·50	+ 9·40

TABLE G.—YALE.—POSITION-ANGLES,

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III_{27}	20	λ	June 20.....	E	·71905	300 19 56·90	− 7 18 25·33	+4·570	−7·073	+24·10	+ 4·87
	22	λ			·72417	19 55·24	18 22·71	+4·379	−7·091	+24·10	+ 4·87
	24	λ	(2)		·72922	19 53·60	18 20·13	+4·188	−7·107	+24·10	+ 4·87
	26	λ			·73471	19 51·82	18 17·32	+3·975	−7·127	+24·10	+ 4·87
III_{28}	33	λ	June 20.....	H	·78768	300 19 34·59	− 7 17 50·21	+1·719	−7·249	+24·13	+ 4·88
	35	λ			·79124	19 33·43	17 48·39	+1·560	−7·255	+24·13	+ 4·88
	37	λ			·80324	19 29·52	17 42·26	+1·007	−7·266	+24·13	+ 4·88
	39	λ	(2)		·80648	19 28·46	17 40·60	+0·856	−7·269	+24·13	+ 4·88
	41	λ			·81742	19 24·89	17 35·01	+0·348	−7·274	+24·13	+ 4·88
	43	λ			·82044	19 23·90	17 33·47	+0·210	−7·274	+24·13	+ 4·88
III^{29}	47	λ	June 22.....	E	·71036	300 8 14·26	− 7 1 45·89	+4·714	−7·119	+24·75	+ 5·12
	49	θ			·71656	8 11·90	1 42·83	+4·486	−7·140	+24·87	+ 5·00
	51	θ			·72142	8 10·04	1 40·45	+4·301	−7·157	+24·87	+ 5·00
	53	λ			·72625	8 8·19	1 38·07	+4·112	−7·173	+24·75	+ 5·12
	55	λ	(2)		·73105	8 6·36	1 35·72	+3·924	−7·187	+24·75	+ 5·12
	57	θ			·73589	8 4·51	1 33·34	+3·730	−7·202	+24·88	+ 5·00
	59	θ			·74023	8 2·85	1 31·21	+3·550	−7·214	+24·88	+ 5·00
	61	λ			·74447	8 1·23	1 29·13	+3·374	−7·224	+24·76	+ 5·13

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
928	d	777	15 37	+ 8	192 15 45	13 37	+ 2 8	+ 0·482	— 0·977	+ 0·212	— 0·204
933	d	818	4 44	— 23	190 4 21	3 21	+ 1 0	+ 0·238	— 0·985	+ 0·175	+ 0·545
934	d	820	0 26	— 25	189 60 1	58 40	+ 1 21	+ 0·322	— 0·985	+ 0·174	+ 0·567
935	d	820	57 53	— 26	189 57 27	56 54	+ 0 33	+ 0·131	— 0·985	+ 0·173	+ 0·576
936	d	821	58 8	— 27	189 57 41	55 10	+ 2 31	+ 0·601	— 0·985	+ 0·173	+ 0·583
939	d	827	37 10	— 43	189 36 27	35 24	+ 1 3	+ 0·253	— 0·986	+ 0·167	+ 0·665
940	d	827	35 0	— 46	189 34 14	32 55	+ 1 19	+ 0·317	— 0·986	+ 0·166	+ 0·673
941	d	828	31 36	— 49	189 30 47	30 41	+ 0 6	+ 0·024	— 0·986	+ 0·165	+ 0·681
942	d	829	31 15	— 52	189 30 23	28 41	+ 1 42	+ 0·410	— 0·986	+ 0·165	+ 0·688

COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
20	λ	1304	4 35	+ 74	275 5 49	5 24	+ 0 25	+ 0·158	+ 0·089	+ 0·996	— 0·664
22	λ	1306	12 48	+ 68	275 13 56	11 47	+ 2 9	+ 0·817	+ 0·091	+ 0·996	— 0·667
24	λ	1308	18 40	+ 62	275 19 42	18 3	+ 1 39	+ 0·628	+ 0·093	+ 0·996	— 0·669
26	λ	1310	25 25	+ 57	275 26 22	24 52	+ 1 30	+ 0·572	+ 0·095	+ 0·996	— 0·672
33	λ	1333	30 36	+ 24	276 31 0	29 26	+ 1 34	+ 0·608	+ 0·113	+ 0·994	— 0·702
35	λ	1334	33 35	+ 22	276 33 57	33 42	+ 0 15	+ 0·097	+ 0·114	+ 0·993	— 0·703
37	λ	1339	51 44	+ 18	276 52 2	48 0	+ 4 2	+ 1·571	+ 0·120	+ 0·993	— 0·710
39	λ	1341	54 17	+ 16	276 54 33	51 52	+ 2 41	+ 1·047	+ 0·120	+ 0·993	— 0·712
41	λ	1345	4 55	+ 12	277 5 7	4 49	+ 0 18	+ 0·117	+ 0·123	+ 0·992	— 0·718
43	λ	1347	7 16	+ 11	277 7 27	8 22	— 0 55	— 0·359	+ 0·124	+ 0·992	— 0·718
47	λ	2287	9 37	+ 65	299 10 42	10 22	+ 0 20	+ 0·222	+ 0·488	+ 0·873	— 0·394
49	θ	1115	20 3	+ 65	115 21 8	22 7	— 0 59	— 0·319	— 0·428	— 0·904	+ 0·454
51	θ	1112	16 43	+ 61	115 17 44	18 13	— 0 29	— 0·156	— 0·427	— 0·904	+ 0·464
53	λ	2297	16 42	+ 56	299 17 38	15 41	+ 1 57	+ 1·303	+ 0·489	+ 0·872	— 0·425
55	λ	2300	16 56	+ 54	299 17 50	17 16	+ 0 34	+ 0·379	+ 0·489	+ 0·872	— 0·436
57	θ	1103	2 7	+ 54	115 3 1	6 23	— 3 22	— 1·080	— 0·423	— 0·906	+ 0·495
59	θ	1101	0 24	+ 52	115 1 16	2 48	— 1 32	— 0·491	— 0·423	— 0·906	+ 0·504
61	λ	2308	21 8	+ 49	299 21 57	21 39	+ 0 18	+ 0·201	+ 0·490	+ 0·872	— 0·466

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III_{30}	63	λ	June 22.....	H	·75633	300 7 56·70	− 7 1 23·31	+2·868	−7·252	+24·76	+ 5·13
	65	θ	(2)		·76902	7 51·84	1 17·07	+2·311	−7·279	+24·89	+ 5·01
	67	θ			·77787	7 48·45	1 12·73	+1·909	−7·295	+24·89	+ 5·01
	69	λ			·79124	7 43·33	1 6·16	+1·296	−7·310	+24·77	+ 5·13
III_{31}	73	θ	June 23.....	E	·75827	300 1 19·20	− 6 53 16·90	+2·664	−7·289	+25·20	+ 5·13
	75	θ	(2)		·76212	1 17·62	53 15·05	+2·498	−7·297	+25·20	+ 5·13
	77	θ			·76534	1 16·29	53 13·51	+2·352	−7·303	+25·20	+ 5·13
	79	θ			·76841	1 15·03	53 12·04	+2·215	−7·308	+25·20	+ 5·13
	81	θ			·77117	1 13·90	53 10·71	+2·089	−7·313	+25·20	+ 5·13
	83	θ			·77420	1 12·65	53 9·26	+1·949	−7·319	+25·20	+ 5·13
	85	θ			·77682	1 11·58	53 8·00	+1·832	−7·322	+25·20	+ 5·13
	87	θ			·77949	1 10·48	53 6·72	+1·710	−7·326	+25·20	+ 5·13
III_{32}	93	θ	June 23.....	H	·86303	300 0 36·03	− 6 52 26·70	−2·199	−7·311	+25·23	+ 5·12
	95	θ	(2)		·86600	0 34·80	52 25·27	−2·333	−7·307	+25·23	+ 5·12
	97	θ			·87686	0 30·30	52 20·07	−2·815	−7·284	+25·23	+ 5·12
	99	θ			·87963	0 29·16	52 18·74	−2·937	−7·278	+25·23	+ 5·12
V_{18}*	148	z	July 5	H	·78013	298 9 57·88	− 5 32 23·91	−0·103	−7·566	+28·61	+ 6·31
	150	z	(2)		·78318	9 55·82	32 22·93	−0·258	−7·566	+28·61	+ 6·31
	152	z			·79467	9 48·05	32 19·26	−0·823	−7·562	+28·61	+ 6·31
	154	z			·79802	9 45·79	32 18·19	−0·994	−7·561	+28·61	+ 6·31
	156	z			·80846	9 38·73	32 14·86	−1·503	−7·553	+28·61	+ 6·31
	158	z			·81171	9 36·53	32 13·82	−1·665	−7·551	+28·61	+ 6·31
V_{19}	164	z	July 6	E	·68616	297 59 39·46	− 5 27 40·46	+4·184	−7·463	+28·82	+ 6·41
	166	z	(2)		·68931	59 37·29	27 39·50	+4·052	−7·470	+28·82	+ 6·41
	168	z			·69303	59 34·73	27 38·36	+3·891	−7·478	+28·82	+ 6·41
	170	z			·69592	59 32·74	27 37·48	+3·763	−7·483	+28·82	+ 6·41
	172	z			·69885	59 30·72	27 36·58	+3·636	−7·490	+28·82	+ 6·41
	174	z			·70331	59 27·65	27 35·21	+3·436	−7·502	+28·82	+ 6·41
	176	z			·70609	59 25·73	27 34·36	+3·312	−7·508	+28·82	+ 6·41
	178	z			·70978	59 23·19	27 33·23	+3·145	−7·516	+28·82	+ 6·41
V_{20}	180	z	July 6	H	·72081	297 59 15·59	− 5 27 29·86	+2·633	−7·535	+28·82	+ 6·41
	182	z	(2)		·72980	59 9·39	27 27·11	+2·205	−7·548	+28·82	+ 6·41
	184	z			·73712	59 4·34	27 24·88	+1·853	−7·558	+28·83	+ 6·41
	186	z			·74561	58 58·48	27 22·29	+1·443	−7·564	+28·83	+ 6·41
	188	z			·75261	58 53·65	27 20·16	+1·096	−7·571	+28·83	+ 6·41
	190	z			·76056	58 48·17	27 17·73	+0·705	−7·574	+28·83	+ 6·41

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
63	λ	2315	25 40	+ 44	299 26 24	25 31	+ 0 53	+ 0·595	+ 0·491	+ 0·871	− 0·491
65	θ	1084	34 18	+ 41	114 34 59	38 44	− 3 45	− 1·182	− 0·416	− 0·909	+ 0·567
67	θ	1079	31 34	+ 38	114 32 12	31 13	+ 0 59	+ 0·309	− 0·415	− 0·910	+ 0·585
69	λ	2336	35 14	+ 37	299 35 51	36 41	− 0 50	− 0·566	+ 0·494	+ 0·869	− 0·571
73	θ	596	13 59	+ 23	87 14 22	18 1	− 3 39	− 0·633	+ 0·048	− 0·999	+ 0·741
75	θ	595	4 38	+ 21	87 4 59	6 55	− 1 56	− 0·335	+ 0·051	− 0·999	+ 0·742
77	θ	593	53 44	+ 19	86 54 3	57 34	− 3 31	− 0·607	+ 0·054	− 0·999	+ 0·742
79	θ	592	47 50	+ 17	86 48 7	48 40	− 0 33	− 0·095	+ 0·056	− 0·998	+ 0·742
81	θ	591	42 6	+ 15	86 42 21	40 32	+ 1 49	+ 0·312	+ 0·058	− 0·998	+ 0·742
83	θ	589	30 8	+ 13	86 30 21	31 41	− 1 20	− 0·228	+ 0·061	− 0·998	+ 0·743
85	θ	588	23 28	+ 12	86 23 40	23 55	− 0 15	− 0·043	+ 0·063	− 0·998	+ 0·743
87	θ	587	9 56	+ 11	86 10 7	16 3	− 5 56	− 1·013	+ 0·067	− 0·998	+ 0·743
93	θ	553	49 11	− 18	81 48 53	52 13	− 3 20	− 0·536	+ 0·142	− 0·990	+ 0·693
95	θ	552	36 2	− 20	81 35 42	42 13	− 6 31	− 1·047	+ 0·146	− 0·989	+ 0·689
97	θ	548	59 33	− 26	80 59 7	65 16	− 6 9	− 0·980	+ 0·157	− 0·988	+ 0·675
99	θ	547	48 27	− 29	80 47 58	55 47	− 7 49	− 1·244	+ 0·160	− 0·987	+ 0·672
148	z	559	53 13	+ 22	112 53 35	62 45	− 9 10	− 1·490	− 0·389	− 0·921	+ 0·701
150	z	557	50 25	+ 22	112 50 47	62 31	−11 44	− 1·901	− 0·388	− 0·922	+ 0·708
152	z	548	49 7	+ 18	112 49 25	61 38	−12 13	− 1·947	− 0·388	− 0·922	+ 0·729
154	z	545	58 19	+ 17	112 58 36	61 24	− 2 48	− 0·444	− 0·390	− 0·921	+ 0·734
156	z	537	49 32	+ 14	112 49 46	60 35	−10 49	− 1·690	− 0·388	− 0·922	+ 0·754
158	z	534	45 10	+ 14	112 45 24	60 21	−14 57	− 2·322	− 0·387	− 0·922	+ 0·760
164	z	117	56 18	+ 43	303 57 1	38 56	+18 5	+ 0·616	+ 0·558	+ 0·830	− 0·387
166	z	119	33 20	+ 43	303 34 3	25 8	+ 8 55	+ 0·309	+ 0·553	+ 0·833	− 0·399
168	z	122	20 53	+ 42	303 21 35	9 41	+11 54	+ 0·423	+ 0·550	+ 0·835	− 0·412
170	z	124	14 24	+ 42	302 75 6	58 6	+17 0	+ 0·613	+ 0·548	+ 0·836	− 0·420
172	z	126	56 57	+ 41	302 57 38	46 53	+10 45	+ 0·394	+ 0·544	+ 0·839	− 0·431
174	z	130	49 58	+ 41	302 50 39	30 30	+20 9	+ 0·762	+ 0·542	+ 0·840	− 0·444
176	z	132	44 0	+ 40	302 44 40	20 24	+24 16	+ 0·932	+ 0·541	+ 0·841	− 0·454
178	z	135	19 33	+ 39	302 20 12	7 52	+12 20	+ 0·484	+ 0·535	+ 0·845	− 0·467
180	z	144	32 23	+ 37	301 33 0	32 51	+ 0 9	+ 0·006	+ 0·523	+ 0·852	− 0·505
182	z	151	22 17	+ 36	301 22 53	7 27	+15 26	+ 0·678	+ 0·521	+ 0·854	− 0·530
184	z	156	14 36	+ 34	300 75 10	47 55	+27 15	+ 1·237	+ 0·519	+ 0·855	− 0·550
186	z	163	30 18	+ 33	300 30 51	27 27	+ 3 24	+ 0·161	+ 0·508	+ 0·861	− 0·578
188	z	169	31 18	+ 32	300 31 50	11 31	+20 19	+ 0·950	+ 0·508	+ 0·861	− 0·596
190	z	175	16 11	+ 30	299 76 41	55 2	+21 39	+ 1·103	+ 0·504	+ 0·864	− 0·613

* V_{18}. Rejected for discordance, apparently some error made in reading position-circle.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
V_{21}	196	z	July 7.....	H	·65886	297 48 22·78	− 5 22 50·05	+5·158	−7·407	+29·03	+ 6·52
	198	z			·66255	48 20·19	22 48·98	+5·020	−7·418	+29·03	+ 6·52
	200	z	(1)		·67225	48 13·39	22 46·16	+4·633	−7·445	+29·03	+ 6·52
	202	z			·67461	48 11·73	22 45·47	+4·538	−7·451	+29·03	+ 6·52
	204	z			·68340	48 5·56	22 42·91	+4·171	−7·475	+29·03	+ 6·52
	206	z			·68551	48 4·08	22 42·30	+4·084	−7·479	+29·03	+ 6·52
V_{22}	212	z	July 7.....	E	·74910	297 47 19·37	− 5 22 23·86	+1·113	−7·579	+29·05	+ 6·53
	214	z			·75414	47 15·83	22 22·40	+0·862	−7·582	+29·05	+ 6·53
	216	z	(1)		·75897	47 12·43	22 21·00	+0·621	−7·584	+29·05	+ 6·53
	218	z			·76463	47 8·45	22 19·35	+0·342	−7·586	+29·05	+ 6·53
	220	z			·76910	47 5·31	22 18·07	+0·118	−7·586	+29·05	+ 6·53
	222	z			·77357	47 2·16	22 16·77	−0·104	−7·586	+29·05	+ 6·53
VI_{12}	228	w	July 12.....	H	·66705	296 47 34·52	− 5 1 48·38	+4·209	−7·514	+30·06	+ 6·97
	230	w			·67532	47 28·33	1 46·63	+3·848	−7·531	+30·06	+ 6·97
	232	w	(2)		·68286	47 22·68	1 45·03	+3·512	−7·548	+30·06	+ 6·97
	234	w			·69564	47 13·11	1 42·32	+2·922	−7·570	+30·06	+ 6·97
	236	w			·70605	47 5·30	1 40·11	+2·427	−7·586	+30·06	+ 6·97
VI_{13}	242	w	July 12.....	E	·74801	296 46 33·83	− 5 1 31·24	+0·352	−7·620	+30·07	+ 6·98
	244	w			·75459	46 28·90	1 29·85	+0·024	−7·620	+30·07	+ 6·98
	246	w	(1)		·76213	46 23·24	1 28·26	−0·360	−7·618	+30·07	+ 6·98
	248	w			·77175	46 16·03	1 26·23	−0·839	−7·615	+30·07	+ 6·98
	250	w			·78010	46 9·76	1 24·47	−1·258	−7·609	+30·07	+ 6·98
	252	w			·78439	46 6·55	1 23·57	−1·469	−7·607	+30·07	+ 6·98
VII_{25}	258	v	July 15.....	H	·64094	296 10 5·12	− 4 52 28·28	+4·895	−7·482	+30·60	+ 7·24
	260	v			·64302	10 3·53	52 27·94	+4·811	−7·489	+30·60	+ 7·24
	262	v			·65245	9 56·35	52 26·39	+4·419	−7·511	+30·60	+ 7·24
	264	v			·65504	9 54·37	52 25·97	+4·308	−7·516	+30·60	+ 7·24
	268	v	(2)		·66371	9 47·77	52 24·55	+3·936	−7·533	+30·60	+ 7·24
	270	v			·66558	9 46·35	52 24·24	+3·848	−7·536	+30·60	+ 7·24
	272	v			·67401	9 39·93	52 22·86	+3·471	−7·555	+30·60	+ 7·24
	274	v			·67592	9 38·47	52 22·54	+3·382	−7·561	+30·60	+ 7·24
VII_{26}	280	v	July 15.....	E	·74508	296 8 45·80	− 4 52 11·26	+0·000	−7·625	+30·61	+ 7·25
	282	v			·74890	8 42·89	52 10·64	−0·192	−7·626	+30·61	+ 7·25
	284	v			·75273	8 39·98	52 10·01	−0·385	−7·624	+30·61	+ 7·25
	286	v	(2)		·75719	8 36·59	52 9·29	−0·613	−7·622	+30·61	+ 7·25
	288	v			·76074	8 33·88	52 8·71	−0·789	−7·620	+30·61	+ 7·25
	290	v			·76577	8 30·05	52 7·90	−1·038	−7·617	+30·61	+ 7·25

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
196	z	848	47 35	+ 65	294 48 40	45 1	+ 3 39	+ 0·900	+ 0·419	+ 0·908	— 0·458
198	z	851	48 21	+ 63	294 49 24	44 18	+ 5 6	+ 1·263	+ 0·420	+ 0·908	— 0·464
200	z	858	42 4	+ 57	294 43 1	42 27	+ 0 34	+ 0·142	+ 0·418	+ 0·908	— 0·483
202	z	860	38 20	+ 56	294 39 16	42 3	— 2 47	— 0·696	+ 0·417	+ 0·909	— 0·489
204	z	867	40 55	+ 51	294 41 46	40 23	+ 1 23	+ 0·349	+ 0·418	+ 0·909	— 0·507
206	z	869	41 35	+ 50	294 42 25	39 59	+ 2 26	+ 0·615	+ 0·418	+ 0·909	— 0·511
212	z	920	31 27	+ 29	294 31 56	28 10	+ 3 46	+ 1·008	+ 0·415	+ 0·910	— 0·644
214	z	924	30 18	+ 28	294 30 46	27 18	+ 3 28	+ 0·927	+ 0·415	+ 0·910	— 0·654
216	z	928	28 16	+ 27	294 28 43	26 28	+ 2 15	+ 0·607	+ 0·414	+ 0·910	— 0·664
218	z	932	27 49	+ 26	294 28 15	25 30	+ 2 45	+ 0·746	+ 0·414	+ 0·910	— 0·677
220	z	936	29 22	+ 24	294 29 46	24 42	+ 5 4	+ 1·380	+ 0·415	+ 0·910	— 0·686
222	z	939	26 20	+ 23	294 26 43	23 57	+ 2 46	+ 0·756	+ 0·414	+ 0·910	— 0·695
228	w	689	56 37	— 56	203 55 41	47 27	+ 8 14	+ 1·650	— 0·914	+ 0·406	— 0·688
230	w	690	22 30	— 51	204 21 39	20 40	+ 0 59	+ 0·197	— 0·911	+ 0·413	— 0·660
232	w	691	52 28	— 48	204 51 40	50 57	+ 0 43	+ 0·144	— 0·907	+ 0·420	— 0·634
234	w	693	48 54	— 42	205 48 12	42 7	+ 6 5	+ 1·227	— 0·900	+ 0·435	— 0·591
236	w	695	31 26	— 39	206 30 47	23 41	+ 7 6	+ 1·435	— 0·895	+ 0·446	— 0·556
242	w	703	14 0	— 27	209 13 33	9 31	+ 4 2	+ 0·825	— 0·873	+ 0·488	— 0·402
244	w	704	40 7	— 25	209 39 42	35 11	+ 4 31	+ 0·925	— 0·869	+ 0·494	— 0·378
246	w	706	7 24	— 24	210 7 0	4 30	+ 2 30	+ 0·514	— 0·865	+ 0·502	— 0·353
248	w	708	46 43	— 23	210 46 20	41 39	+ 4 41	+ 0·965	— 0·859	+ 0·512	— 0·318
250	w	710	18 22	— 21	211 18 1	13 48	+ 4 13	+ 0·871	— 0·854	+ 0·520	— 0·289
252	w	711	32 56	— 21	211 32 35	30 9	+ 2 26	+ 0·503	— 0·852	+ 0·523	— 0·273
258	v	433	37 31	+ 6	322 37 37	40 13	— 2 36	— 0·328	+ 0·795	+ 0·607	— 0·066
260	v	434	38 3	+ 7	322 38 10	31 16	+ 6 54	+ 0·871	+ 0·795	+ 0·607	— 0·074
262	v	440	49 53	+ 12	321 50 5	51 45	— 1 40	— 0·213	+ 0·786	+ 0·618	— 0·117
264	v	441	31 10	+ 13	321 31 23	40 58	— 9 35	— 1·229	+ 0·783	+ 0·622	— 0·131
268	v	447	1 53	+ 16	321 2 9	5 47	— 3 38	— 0·473	+ 0·778	+ 0·629	— 0·169
270	v	448	46 32	+ 17	320 46 49	58 14	—11 25	— 1·488	+ 0·775	+ 0·632	— 0·179
272	v	453	27 7	+ 20	320 27 27	24 49	+ 2 38	+ 0·347	+ 0·771	+ 0·637	— 0·215
274	v	455	17 45	+ 20	320 18 5	17 22	+ 0 43	+ 0·095	+ 0·769	+ 0·639	— 0·224
280	v	500	5 26	+ 31	316 5 57	11 1	— 5 4	— 0·737	+ 0·720	+ 0·693	— 0·529
282	v	503	2 43	+ 31	315 63 14	58 43	+ 4 31	+ 0·661	+ 0·720	+ 0·694	— 0·544
284	v	505	52 37	+ 31	315 53 8	46 35	+ 6 33	+ 0·962	+ 0·718	+ 0·696	— 0·558
286	v	508	33 16	+ 32	315 33 48	32 33	+ 1 15	+ 0·185	+ 0·714	+ 0·700	— 0·576
288	v	511	18 47	+ 32	315 19 19	21 27	— 2 8	— 0·317	+ 0·711	+ 0·703	— 0·592
290	v	514	11 19	+ 32	315 11 51	5 55	+ 5 56	+ 0·887	+ 0·710	+ 0·705	— 0·611

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
	294	u	July 16.....	E	·65734	295 57 10·50	− 4 49 49·62	+4·072	−7·531	+30·74	+ 7·31
	296	u			·66025	57 8·28	49 49·19	+3·944	−7·537	+30·74	+ 7·31
	297	u			·66348	57 5·81	49 48·71	+3·799	−7·543	+30·74	+ 7·31
	299	u			·66642	57 3·57	49 48·28	+3·667	−7·547	+30·74	+ 7·31
VII_{26a}*	302	u	(1)		·67513	56 56·93	49 46·99	+3·272	−7·564	+30·74	+ 7·31
	303	u			·67820	56 54·59	49 46·54	+3·130	−7·569	+30·74	+ 7·31
	305	u			·68205	56 51·66	49 45·94	+2·947	−7·576	+30·74	+ 7·31
	307	u			·68515	56 49·29	49 45·52	+2·801	−7·580	+30·74	+ 7·31
	309	u	July 16.....	H	·76260	295 55 50·23	− 4 49 34·15	−1·050	−7·617	+30·75	+ 7·32
	311	u			·76883	55 45·48	49 33·24	−1·362	−7·613	+30·75	+ 7·32
	312	u			·77648	55 39·64	49 32·12	−1·739	−7·606	+30·76	+ 7·32
	313	u			·78226	55 35·24	49 31·28	−2·026	−7·602	+30·76	+ 7·32
	314	u			·78907	55 30·05	49 30·28	−2·354	−7·594	+30·76	+ 7·32
	315	u			·79474	55 25·73	49 29·46	−2·627	−7·586	+30·76	+ 7·32
VII_{26b}*	316	u	(1)		·80081	55 21·10	49 28·57	−2·915	−7·576	+30·76	+ 7·32
	319	u			·81910	55 7·14	49 25·92	−3·756	−7·544	+30·76	+ 7·33
	320	u			·82496	55 2·67	49 25·07	−4·016	−7·534	+30·76	+ 7·33
	321	u			·83141	54 56·75	49 24·14	−4·295	−7·518	+30·76	+ 7·33
	322	u			·83853	54 52·33	49 23·11	−4·591	−7·502	+30·76	+ 7·33
	323	u			·84614	54 46·52	49 22·00	−4·903	−7·483	+30·76	+ 7·33
	324	u			·85179	54 42·21	49 21·18	−5·129	−7·469	+30·76	+ 7·33
	328	t	July 17.....	H	·64954	295 44 33·88	− 4 47 30·94	+4·268	−7·519	+30·89	+ 7·40
	330	t			·65203	44 31·99	47 30·61	+4·159	−7·524	+30·89	+ 7·40
	332	t			·66026	44 25·71	47 29·53	+3·798	−7·541	+30·89	+ 7·40
VII_{27}	334	t	(1)		·66292	44 23·69	47 29·18	+3·679	−7·546	+30·89	+ 7·40
	336	t			·67280	44 16·14	47 27·88	+3·224	−7·565	+30·89	+ 7·40
	338	t			·67556	44 14·05	47 27·52	+3·099	−7·571	+30·89	+ 7·40
	342	t	July 17.....	E	·76783	295 43 3·71	− 4 47 15·47	−1·475	−7·610	+30·90	+ 7·41
	344	t			·77192	43 0·59	47 14·94	−1·678	−7·606	+30·90	+ 7·41
	346	t			·77530	42 58·01	47 14·50	−1·847	−7·602	+30·90	+ 7·41
	348	t			·77891	42 55·26	47 14·03	−2·022	−7·600	+30·90	+ 7·41
VII_{28}	352	t	(1)		·78833	42 48·07	47 12·81	−2·483	−7·588	+30·91	+ 7·42
	354	t			·79156	42 45·61	47 12·39	−2·637	−7·583	+30·91	+ 7·42
	356	t			·79474	42 43·19	47 11·98	−2·787	−7·580	+30·91	+ 7·42
	358	t			·79793	42 40·76	47 11·56	−2·940	−7·575	+30·91	+ 7·42

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	′			
294	u	109	50 51	— 9	154 50 42	55 41	— 4 59	— 0·158	— 0·905	— 0·425	— 0·047
296	u	108	51 23	— 9	155 51 14	57 28	— 6 14	— 0·196	— 0·912	— 0·409	— 0·050
297	u	107	11 3	— 10	157 10 53	7 43	+ 3 10	+ 0·099	— 0·922	— 0·388	— 0·056
299	u	105	49 42	— 10	157 49 32	73 23	— 23 51	— 0·729	— 0·926	— 0·377	— 0·053
302	u	102	52 1	— 10	161 51 51	37 33	+ 14 18	+ 0·424	— 0·950	— 0·312	— 0·073
303	u	101	50 33	— 11	162 50 22	52 58	— 2 36	— 0·076	— 0·955	— 0·295	— 0·075
305	u	99	43 50	— 11	164 43 39	29 39	+ 14 0	+ 0·403	— 0·965	— 0·263	— 0·084
307	u	98	52 52	— 11	165 52 41	50 31	+ 2 10	+ 0·062	— 0·970	— 0·244	— 0·085
309	u	92	51 4	— 17	204 50 47	47 23	+ 3 24	+ 0·091	— 0·908	+ 0·420	— 0·225
311	u	94	38 29	— 17	209 38 12	49 32	+108 40	+ 2·971	— 0·869	+ 0·494	— 0·258
312	u	96	58 40	— 18	212 58 22	25 25	+ 92 57	+ 2·596	— 0·839	+ 0·544	— 0·270
313	u	98	42 49	— 19	214 42 30	1 31	+ 40 59	+ 1·169	— 0·822	+ 0·570	— 0·267
314	u	100	24 29	— 21	216 84 8	57 28	+ 26 40	+ 0·776	— 0·794	+ 0·607	— 0·275
315	u	102	58 34	— 22	219 58 12	17 20	+ 40 52	+ 1·213	— 0·766	+ 0·642	— 0·286
316	u	105	12 48	— 25	221 72 23	40 43	+ 31 40	+ 0·967	— 0·741	+ 0·672	— 0·294
319	u	113	17 44	— 30	226 17 14	10 10	—112 56	— 3·713	— 0·691	+ 0·723	— 0·286
320	u	116	12 49	— 33	230 72 16	2 8	+ 70 8	+ 2·367	— 0·627	+ 0·779	— 0·336
321	u	120	2 57	— 36	232 62 21	16 1	+ 46 20	+ 1·617	— 0·601	+ 0·799	— 0·343
322	u	124	8 35	— 41	235 7 54	59 3	+ 68 51	+ 2·484	— 0·572	+ 0·820	— 0·353
323	u	128	0 47	— 47	236 60 0	0 2	+ 59 58	+ 2·233	— 0·545	+ 0·839	— 0·362
324	u	131	21 55	— 53	237 81 2	24 20	+ 56 42	+ 2·161	— 0·525	+ 0·851	— 0·368
328	t	148	14 36	— 15	233 74 21	42 59	+ 31 22	+ 1·351	— 0·584	+ 0·811	— 0·859
330	t	149	47 12	— 15	234 46 57	16 15	+ 30 42	+ 1·331	— 0·577	+ 0·817	— 0·853
332	t	154	16 32	— 15	236 16 17	1 34	+ 14 43	+ 0·659	— 0·555	+ 0·832	— 0·837
334	t	156	12 30	— 15	236 72 15	34 5	+ 38 10	+ 1·732	— 0·542	+ 0·841	— 0·834
336	t	162	38 28	— 15	238 38 13	30 12	+ 8 1	+ 0·378	— 0·521	+ 0·854	— 0·813
338	t	164	5 7	— 15	239 4 52	0 51	+ 4 1	+ 0·192	— 0·514	+ 0·858	— 0·809
342	t	227	41 53	— 27	251 41 26	25 39	+ 15 47	+ 1·042	— 0·314	+ 0·949	— 0·676
344	t	230	0 10	— 28	251 59 42	48 57	+ 10 45	+ 0·719	— 0·309	+ 0·951	— 0·672
346	t	232	17 56	— 29	252 17 27	7 57	+ 9 30	+ 0·641	— 0·304	+ 0·953	— 0·668
348	t	235	52 5	— 30	252 51 35	27 34	+ 24 1	+ 1·643	— 0·295	+ 0·956	— 0·668
352	t	242	28 38	— 33	253 28 5	16 51	+ 11 14	+ 0·791	— 0·285	+ 0·959	— 0·658
354	t	244	35 1	— 34	253 34 27	33 13	+ 1 14	+ 0·088	— 0·283	+ 0·959	— 0·654
356	t	246	2 24	— 35	253 61 49	48 49	+ 13 0	+ 0·930	— 0·275	+ 0·961	— 0·653
358	t	249	16 11	— 37	254 15 34	4 18	+ 11 16	+ 0·816	— 0·271	+ 0·963	— 0·650

* VII_{20a} and VII_{20b}. Measured as a double star, thus * ✳ * ✳, but the distance is too great for this, and the results being unreliable, are therefore rejected.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
VII$_{29}$	362	t	July 18.....	E	·64321	295° 31′ 57″·12	− 4° 45′ 28″·04	+4″·391	−7″·509	+31″·03	+ 7″·50
	364	t			·64820	31 53·33	45 27·46	+4·181	−7·522	+31·03	+ 7·50
	366	t			·65204	31 50·41	45 27·02	+4·014	−7·530	+31·03	+ 7·50
	368	t	(1)		·65650	31 47·02	45 26·50	+3·816	−7·537	+31·03	+ 7·50
	370	t			·66661	31 39·33	45 25·34	+3·359	−7·558	+31·03	+ 7·50
	372	t			·67012	31 36·65	45 24·94	+3·200	−7·563	+31·03	+ 7·50
	374	t			·67330	31 34·24	45 24·57	+3·051	−7·569	+31·03	+ 7·50
	376	t			·67684	31 31·55	45 24·16	+2·886	−7·574	+31·03	+ 7·50
VII$_{30}$	382	t	July 18.....	H	·77158	295 30 19·53	− 4 45 13·31	−1·826	−7·600	+31·04	+ 7·52
	384	t			·77469	30 17·17	45 12·96	−1·978	−7·598	+31·04	+ 7·52
	386	t			·78442	30 9·77	45 11·85	−2·452	−7·586	+31·04	+ 7·52
	388	t			·78715	30 7·70	45 11·55	−2·581	−7·581	+31·04	+ 7·52
	390	t	(2)		·79625	30 0·78	45 10·52	−3·017	−7·569	+31·04	+ 7·52
	392	t			·79891	29 58·76	45 10·22	−3·139	−7·564	+31·04	+ 7·52
	394	t			·81079	29 49·73	45 8·88	−3·683	−7·542	+31·04	+ 7·52
	396	t			·81352	29 47·66	45 8·57	−3·804	−7·537	+31·04	+ 7·52
	398	t			·82285	29 40·57	45 7·52	−4·213	−7·519	+31·04	+ 7·52
	400	t			·82535	29 38·67	45 7·24	−4·319	−7·513	+31·04	+ 7·52
VIII$_{18}$	406	q	July 20.....	E	·66409	295 6 27·62	− 4 42 7·19	+3·170	−7·554	+31·29	+ 7·62
	408	q			·66689	6 25·51	42 6·95	+3·036	−7·559	+31·29	+ 7·62
	410	q			·66895	6 23·96	42 6·78	+2·942	−7·561	+31·29	+ 7·62
	412	q			·67137	6 22·14	42 6·58	+2·827	−7·565	+31·29	+ 7·62
	414	q			·67784	6 17·28	42 6·05	+2·517	−7·573	+31·29	+ 7·62
	416	q			·68101	6 14·90	42 5·78	+2·365	−7·577	+31·29	+ 7·62
VIII$_{19}$	420	q	July 21.....	H	·62352	294 54 28·83	− 4 40 54·83	+4·792	−7·471	+31·40	+ 7·73
	422	q			·63153	54 22·85	40 54·28	+4·460	−7·490	+31·40	+ 7·73
	424	q			·63869	54 17·51	40 53·80	+4·158	−7·506	+31·40	+ 7·73
	426	q			·64560	54 12·36	40 53·34	+3·853	−7·519	+31·40	+ 7·73
	428	q	(2)		·65396	54 6·13	40 52·77	+3·478	−7·535	+31·40	+ 7·73
	430	q			·66043	54 1·31	40 52·34	+3·184	−7·546	+31·40	+ 7·73
	432	q			·66728	53 56·19	40 51·88	+2·862	−7·556	+31·40	+ 7·73
	434	q			·67407	53 51·13	40 51·43	+2·539	−7·565	+31·40	+ 7·73
VIII$_{20}$	440	q	July 21.....	E	·78002	294 52 32·19	− 4 40 44·42	−2·715	−7·562	+31·41	+ 7·73
	442	q			·78350	52 29·59	40 44·19	−2·877	−7·556	+31·41	+ 7·73
	444	q			·78650	52 27·36	40 44·00	−3·018	−7·552	+31·41	+ 7·73
	446	q			·78949	52 25·13	40 43·80	−3·159	−7·547	+31·41	+ 7·73
	448	q	(2)		·79594	52 20·33	40 43·38	−3·456	−7·536	+31·41	+ 7·73
	450	q			·79929	52 17·83	40 43·17	−3·607	−7·529	+31·41	+ 7·73
	452	q			·80244	52 15·48	40 42·96	−3·747	−7·521	+31·41	+ 7·73
	454	q			·80605	52 12·79	40 42·73	−3·905	−7·516	+31·41	+ 7·73

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	° ′ ″	″	° ′ ″	° ′ ″	′ ″	″			
362	t	874	20 10	+ 49	272 20 59	18 37	+ 2 22	+ 0·602	+ 0·041	+ 0·999	− 0·732
364	t	878	24 53	+ 45	272 25 38	20 13	+ 5 25	+ 1·384	+ 0·042	+ 0·999	− 0·733
366	t	881	23 48	+ 42	272 24 30	21 25	+ 3 5	+ 0·790	+ 0·042	+ 0·999	− 0·735
368	t	885	28 9	+ 39	272 28 48	22 49	+ 5 59	+ 1·540	+ 0·043	+ 0·999	− 0·737
370	t	893	31 1	+ 32	272 31 33	25 54	+ 5 39	+ 1·468	+ 0·044	+ 0·999	− 0·740
372	t	896	30 40	+ 30	272 31 10	26 59	+ 4 11	+ 1·090	+ 0·044	+ 0·999	− 0·741
374	t	898	30 49	+ 28	272 31 17	27 56	+ 3 21	+ 0·875	+ 0·044	+ 0·999	− 0·743
376	t	901	33 6	+ 27	272 33 33	29 2	+ 4 31	+ 1·184	+ 0·045	+ 0·999	− 0·743
382	t	978	59 55	− 10	272 59 45	55 18	+ 4 27	+ 1·266	+ 0·052	+ 0·999	− 0·769
384	t	981	56 50	− 12	272 56 38	56 5	+ 0 33	+ 0·157	+ 0·051	+ 0·999	− 0·769
386	t	989	1 3	− 16	272 60 47	58 34	+ 2 13	+ 0·638	+ 0·052	+ 0·999	− 0·771
388	t	991	4 23	− 17	272 64 6	59 15	+ 4 51	+ 1·398	+ 0·054	+ 0·999	− 0·771
390	t	998	59 55	− 22	272 59 33	61 31	− 1 58	− 0·571	+ 0·052	+ 0·999	− 0·772
392	t	1000	5 52	− 23	273 5 29	2 11	+ 3 18	+ 0·960	+ 0·054	+ 0·999	− 0·772
394	t	1010	8 28	− 30	273 7 58	5 6	+ 2 52	+ 0·842	+ 0·054	+ 0·999	− 0·773
396	t	1012	9 55	− 33	273 9 22	5 45	+ 3 37	+ 1·064	+ 0·055	+ 0·998	− 0·773
398	t	1020	9 16	− 40	273 8 36	7 59	+ 0 37	+ 0·183	+ 0·055	+ 0·998	− 0·773
400	t	1021	7 23	− 42	273 6 41	8 36	− 1 55	− 0·569	+ 0·054	+ 0·999	− 0·773
406	q	950	29 59	+ 3	71 30 2	35 35	− 5 33	− 1·533	+ 0·317	− 0·948	+ 0·816
408	q	948	29 27	+ 2	71 29 29	32 14	− 2 45	− 0·758	+ 0·318	− 0·948	+ 0·813
410	q	947	26 28	+ 1	71 26 29	29 46	− 3 17	− 0·904	+ 0·318	− 0·948	+ 0·810
412	q	945	24 29	+ 0	71 24 29	26 53	− 2 24	− 0·660	+ 0·319	− 0·948	+ 0·808
414	q	940	14 47	− 2	71 14 45	19 3	− 4 18	− 1·176	+ 0·321	− 0·947	+ 0·798
416	q	938	12 27	− 3	71 12 24	15 11	− 2 47	− 0·760	+ 0·322	− 0·947	+ 0·794
420	q	416	29 10	− 62	26 28 8	37 29	− 9 21	− 1·132	+ 0·895	− 0·446	+ 0·761
422	q	414	49 45	− 58	25 48 47	48 51	− 0 4	− 0·008	+ 0·900	− 0·435	+ 0·726
424	q	412	0 38	− 54	24 59 44	64 59	− 5 15	− 0·629	+ 0·906	− 0·423	+ 0·694
426	q	410	19 20	− 51	24 18 29	22 6	− 3 37	− 0·431	+ 0·911	− 0·411	+ 0·659
428	q	408	19 33	− 48	23 18 45	29 43	−10 58	− 1·302	+ 0·918	− 0·396	+ 0·617
430	q	407	44 51	− 45	22 44 6	48 44	− 4 38	− 0·549	+ 0·922	− 0·386	+ 0·583
432	q	405	55 55	− 41	21 55 14	64 49	− 9 35	− 1·129	+ 0·928	− 0·373	+ 0·547
434	q	403	19 10	− 38	21 18 32	21 4	− 2 32	− 0·297	+ 0·932	− 0·363	+ 0·511
440	q	388	24 31	+ 15	9 24 46	20 13	+ 4 33	+ 0·514	+ 0·987	− 0·164	− 0·144
442	q	388	47 18	+ 18	8 47 36	55 49	− 8 13	− 0·927	+ 0·988	− 0·153	− 0·168
444	q	387	25 18	+ 20	8 25 38	34 50	− 9 12	− 1·035	+ 0·989	− 0·146	− 0·188
446	q	387	4 49	+ 22	8 5 11	13 50	− 8 39	− 0·974	+ 0·990	− 0·140	− 0·206
448	q	387	25 20	+ 27	7 25 47	28 36	− 2 49	− 0·317	+ 0·992	− 0·129	− 0·245
450	q	387	1 6	+ 30	7 1 36	5 5	− 3 29	− 0·392	+ 0·993	− 0·122	− 0·265
452	q	387	29 21	+ 33	6 29 54	42 57	−13 3	− 1·469	+ 0·994	− 0·113	− 0·287
454	q	387	20 37	+ 36	6 21 13	17 38	+ 3 35	+ 0·403	+ 0·994	− 0·110	− 0·304

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VIII$_{21}$	460	q	July 22.....	E	·63046	294 42 1·58	− 4 39 54·61	+4·363	−7·487	+31·49	+ 7·81
	462	q			·63447	41 58·62	39 54·40	+4·196	−7·496	+31·49	+ 7·81
	464	q			·63889	41 55·35	39 54·17	+4·004	−7·504	+31·49	+ 7·81
	466	q	(2)		·64175	41 53·24	39 54·02	+3·877	−7·509	+31·49	+ 7·81
	468	q			·65444	41 43·88	39 53·36	+3·306	−7·534	+31·49	+ 7·81
	470	q			·65730	41 41·77	39 53·21	+3·175	−7·539	+31·49	+ 7·81
	472	q			·66036	41 39·51	39 53·06	+3·032	−7·544	+31·49	+ 7·81
	474	q			·66429	41 36·61	39 52·86	+2·847	−7·549	+31·49	+ 7·81
IX$_{13}$	480	p	July 23.....	H	·62465	294 29 52·41	− 4 39 10·76	+4·466	−7·473	+31·56	+ 7·83
	482	q			·63439	29 45·31	39 10·40	+4·052	−7·494	+31·59	+ 7·91
	484	q			·64390	29 38·39	39 10·06	+3·632	−7·511	+31·59	+ 7·91
	486	p	(2)		·65867	29 27·64	39 9·53	+2·955	−7·537	+31·56	+ 7·83
	488	p			·66855	29 20·44	39 9·17	+2·486	−7·549	+31·56	+ 7·83
	490	q			·67709	29 14·28	39 8·87	+2·071	−7·561	+31·59	+ 7·91
X$_{14}$*	516	p	July 25.....	H	·61449	294 6 4·92	− 4 38 28·78	+4·604	−7·446	+31·73	+ 8·02
	518	p			·61702	6 3·13	38 28·77	+4·497	−7·449	+31·73	+ 8·02
	520	p			·62506	5 57·47	38 28·72	+4·159	−7·468	+31·73	+ 8·02
	522	p			·62718	5 55·97	38 28·71	+4·068	−7·471	+31·73	+ 8·02
	524	p			·63817	5 48·22	38 28·64	+3·583	−7·491	+31·73	+ 8·02
	526	p	(2)		·64053	5 46·56	38 28·63	+3·476	−7·496	+31·73	+ 8·02
	528	p			·65011	5 39·81	38 28·57	+3·038	−7·512	+31·73	+ 8·02
	530	p			·65189	5 38·55	38 28·56	+2·956	−7·514	+31·73	+ 8·02
	532	p			·66029	5 32·63	38 28·52	+2·557	−7·526	+31·73	+ 8·02
	534	p			·66252	5 31·06	38 28·51	+2·452	−7·529	+31·73	+ 8·02
X$_{15}$	540	p	July 25.....	E	·75928	294 4 22·95	− 4 38 28·07	−2·339	−7·530	+31·74	+ 8·03
	542	p			·76424	4 19·46	38 28·05	−2·572	−7·524	+31·74	+ 8·03
	544	p	(2)		·77014	4 15·32	38 28·03	−2·854	−7·516	+31·74	+ 8·03
	546	p			·77591	4 11·26	38 28·01	−3·124	−7·508	+31·74	+ 8·03
	548	p			·78135	4 7·44	38 27·99	−3·374	−7·499	+31·74	+ 8·03
	550	p			·78594	4 4·21	38 27·98	−3·580	−7·489	+31·74	+ 8·03
XI$_{24}$	554	k	Aug. 2	E	·68074	292 40 30·04	− 4 45 23·88	+0·277	−7·423	+32·02	+ 8·55
	556	i			·68555	40 27·38	45 24·39	+0·038	−7·424	+32·07	+ 8·50
	558	i			·68988	40 24·98	45 24·84	−0·174	−7·425	+32·07	+ 8·50
	560	k			·69424	40 22·57	45 25·30	−0·390	−7·423	+32·02	+ 8·55
	562	k	(3)		·70178	40 18·39	45 26·09	−0·760	−7·420	+32·02	+ 8·55
	564	i			·70952	40 14·11	45 26·91	−1·140	−7·416	+32·07	+ 8·50
	566	i			·71405	40 11·60	45 27·38	−1·358	−7·413	+32·07	+ 8·50
	568	k			·71912	40 8·80	45 27·91	−1·602	−7·409	+32·02	+ 8·55

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
460	q	706	47 16	+ 36	307 47 52	44 50	+ 3 2	+ 0·623	+ 0·613	+ 0·790	— 0·325
462	q	709	40 49	+ 36	307 41 25	36 22	+ 5 3	+ 1·041	+ 0·611	+ 0·791	— 0·337
464	q	712	25 52	+ 36	307 26 28	27 3	— 0 35	— 0·121	+ 0·608	+ 0·794	— 0·353
466	q	714	27 24	+ 36	307 28 0	21 5	+ 6 55	+ 1·436	+ 0·608	+ 0·794	— 0·361
468	q	722	55 31	+ 35	306 56 6	54 55	+ 1 11	+ 0·249	+ 0·601	+ 0·799	— 0·404
470	q	724	48 32	+ 34	306 49 6	49 5	+ 0 1	+ 0·004	+ 0·599	+ 0·801	— 0·415
472	q	726	45 19	+ 34	306 45 53	42 50	+ 3 3	+ 0·644	+ 0·599	+ 0·801	— 0·424
474	q	728	33 51	+ 33	306 34 24	34 54	— 0 30	— 0·106	+ 0·596	+ 0·803	— 0·437
480	p	1862	13 22	+ 54	102 14 16	18 2	— 3 46	— 2·040	— 0·212	— 0·977	+ 0·636
482	q	1378	14 40	+ 48	290 15 28	14 9	+ 1 19	+ 0·528	+ 0·346	+ 0·938	— 0·563
484	q	1385	10 53	+ 44	290 11 37	8 36	+ 3 1	+ 1·215	+ 0·345	+ 0·939	— 0·580
486	p	1836	23 24	+ 34	102 23 58	26 21	— 2 23	— 1·273	— 0·215	— 0·977	+ 0·674
488	p	1829	28 30	+ 30	102 29 0	28 49	+ 0 11	+ 0·098	— 0·216	— 0·976	+ 0·683
490	q	1409	48 42	+ 31	289 49 13	49 44	— 0 31	— 0·212	+ 0·339	+ 0·941	— 0·641
516	p	532	45 20	+ 30	131 45 50	50 12	— 4 22	— 0·676	— 0·666	— 0·746	+ 0·251
518	p	531	19 14	+ 30	131 79 44	58 18	+21 26	+ 3·311	— 0·673	— 0·739	+ 0·249
520	p	526	23 12	+ 29	132 23 41	24 17	— 0 36	— 0·092	— 0·674	— 0·739	+ 0·272
522	p	525	24 29	+ 29	132 24 58	31 14	— 6 16	— 0·957	— 0·674	— 0·738	+ 0·277
524	p	519	55 12	+ 29	132 55 41	67 45	—12 4	— 1·822	— 0·651	— 0·732	+ 0·305
526	p	518	5 13	+ 29	133 5 42	15 43	—10 1	— 1·510	— 0·683	— 0·730	+ 0·311
528	p	512	45 26	+ 29	133 45 55	48 25	— 2 30	— 0·372	— 0·692	— 0·722	+ 0·332
530	p	511	50 35	+ 29	133 51 4	54 35	— 3 31	— 0·523	— 0·693	— 0·721	+ 0·336
532	p	507	23 55	+ 29	134 24 24	24 7	+ 0 17	+ 0·042	+ 0·700	— 0·714	+ 0·359
534	p	506	16 18	+ 29	134 16 47	32 2	—15 15	— 2·245	— 0·698	— 0·716	+ 0·368
540	p	456	48 30	+ 35	140 49 5	54 23	— 5 18	— 0·703	— 0·775	— 0·632	+ 0·657
542	p	454	15 1	+ 36	141 15 37	16 1	— 0 24	— 0·053	— 0·780	— 0·626	+ 0·671
544	p	451	36 29	+ 37	141 37 6	42 6	— 5 0	— 0·656	— 0·784	— 0·621	+ 0·690
546	p	449	3 56	+ 38	142 4 34	7 55	— 3 21	— 0·438	— 0·789	— 0·615	+ 0·708
548	p	446	24 58	+ 39	142 25 37	32 27	— 6 50	— 0·887	— 0·793	— 0·610	+ 0·725
550	p	444	52 24	+ 41	142 53 5	53 26	— 0 21	— 0·045	— 0·797	— 0·603	+ 0·737
554	k	802	28 18	— 16	194 28 2	33 45	— 5 43	— 1·334	— 0·968	+ 0·250	— 0·213
556	i	922	43 51	+ 1	358 43 52	39 31	+ 4 21	+ 1·166	+ 1·000	+ 0·022	— 0·012
558	i	922	25 53	+ 3	358 25 56	29 47	— 3 51	— 1·042	+ 1·000	+ 0·027	— 0·037
560	k	806	3 39	— 12	195 3 27	5 44	— 1 17	— 0·301	— 0·966	+ 0·260	— 0·154
562	k	808	24 16	— 9	195 24 7	23 30	+ 0 37	+ 0·145	— 0·964	+ 0·266	— 0·124
564	i	920	49 6	+ 12	357 49 18	45 32	+ 3 46	+ 1·008	+ 0·999	+ 0·038	— 0·141
566	i	920	32 15	+ 15	357 32 30	35 19	— 2 49	— 0·754	+ 0·999	+ 0·043	— 0·167
568	k	812	59 10	— 3	195 59 7	63 54	— 4 47	— 1·130	— 0·961	+ 0·275	— 0·051

* Set X_{14}. Rejected on account of the large discordances of the individual observations.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax. α	Parallax. δ	Star Correction. α	Star Correction. δ
						° ′ ″	° ′ ″	″	″	″	″
XI_{25}	570	h	Aug. 3.....	E	·71741	292 31 8·71	− 4 47 19·15	−1·667	−7·385	+32·00	+ 8·59
	572	i	(2)		·72426	31 5·09	47 19·95	−1·993	−7·378	+32·08	+ 8·57
	574	i			·72970	31 2·21	47 20·59	−2·252	−7·371	+32·08	+ 8·57
	576	h			·73931	30 57·13	47 21·71	−2·697	−7·360	+32·00	+ 8·59
XI_{25a}	578	h	Aug. 3.....	H	·75067	292 30 51·13	− 4 47 23·05	−3·212	−7·342	+32·00	+ 8·59
	580	i	(2)		·76308	30 44·58	47 24·52	−3·760	−7·318	+32·08	+ 8·58
	582	i			·77488	30 38·36	47 25·92	−4·255	−7·294	+32·08	+ 8·58
	584	h			·78387	30 33·62	47 26·98	−4·618	−7·271	+32·00	+ 8·60
	586*	h			·79388	30 28·35	47 27·16	−5·004	−7·247	+32·00	+ 8·60
XII_{24}	588	g	Aug. 5.....	E	·60856	292 15 14·02	− 4 51 21·41	+3·232	−7·295	+32·00	+ 8·69
	590	g	(2)		·61208	15 12·33	51 21·90	+3·075	−7·301	+32·00	+ 8·69
	592	g			·61483	15 11·01	51 22·28	+2·950	−7·306	+32·00	+ 8·69
	594	g			·61813	15 9·42	51 22·74	+2·804	−7·312	+32·00	+ 8·69
	598	g			·62723	15 5·06	51 24·01	+2·387	−7·324	+32·00	+ 8·69
	600	g			·63103	15 3·23	51 24·54	+2·206	−7·329	+32·00	+ 8·69
	602	g			·63339	15 2·10	51 24·86	+2·097	−7·332	+32·00	+ 8·69
	604	g			·63648	15 0·62	51 25·29	+1·953	−7·336	+32·00	+ 8·69
XII_{25}	608	f	Aug. 7.....	E	·57867	292 0 19·93	− 4 56 15·03	+4·206	−7·199	+31·99	+ 8·77
	610	f	(2)		·58467	0 17·37	56 15·99	+3·965	−7·212	+31·99	+ 8·77
	612	f			·58887	0 15·58	56 16·66	+3·789	−7·221	+31·99	+ 8·77
	614	f			·60043	0 10·65	56 18·49	+3·291	−7·241	+31·99	+ 8·77
	616	f			·60431	0 8·99	56 19·12	+3·121	−7·248	+31·99	+ 8·77
	618	f			·60796	0 7·44	56 19·70	+2·958	−7·253	+31·99	+ 8·77
XII_{26}	620	f		E	·73088	291 59 15·27	− 4 56 39·37	−2·835	−7·255	+31·99	+ 8·77
	622	f	(2)		·73463	59 13·69	56 39·97	−3·006	−7·248	+31·99	+ 8·77
	624	f			·74315	59 10·09	56 41·34	−3·379	−7·234	+31·99	+ 8·77
	626	f			·74897	59 7·63	56 42·28	−3·629	−7·222	+31·99	+ 8·77
	628	f			·75121	59 6·69	56 42·64	−3·722	−7·219	+31·99	+ 8·77
	630	f			·75442	59 5·33	56 43·16	−3·859	−7·213	+31·99	+ 8·77
XII_{27}	632	f	Aug. 8.....	E	·70177	291 52 38·23	− 4 59 19·94	−1·623	−7·261	+31·96	+ 8·82
	634	f	(2)		·70607	52 36·54	59 20·67	−1·825	−7·257	+31·96	+ 8·82
	636	f			·70968	52 35·11	59 21·28	−1·996	−7·254	+31·96	+ 8·82
	638	f			·71350	52 33·60	59 21·93	−2·172	−7·249	+31·96	+ 8·82

* XI_{25a}. No. 586. Seconds of Apparent Declination should be 35″·41 instead of 34″·41. The error was discovered on revisal for discussion with Ephemeris II., and is corrected in that discussion.

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
570	h	1069	24 29	+ 34	144 25 3	25 32	− 0 29	− 0·150	− 0·813	− 0·582	+ 0·565
572	i	996	8 54	+ 36	324 9 30	5 57	+ 3 33	+ 1·029	+ 0·811	+ 0·585	− 0·593
574	i	997	57 30	+ 36	323 58 6	55 56	+ 2 10	+ 0·628	+ 0·809	+ 0·588	− 0·615
576	h	1064	59 50	+ 39	145 0 29	3 19	− 2 50	− 0·877	− 0·819	− 0·574	+ 0·643
578	h	1061	21 34	+ 41	145 22 15	22 59	− 0 44	− 0·226	− 0·823	− 0·568	+ 0·681
580	i	1005	50 59	+ 42	322 51 41	55 23	− 3 42	− 1·081	+ 0·797	+ 0·604	− 0·742
582	i	1008	35 39	+ 44	322 36 23	34 21	+ 2 2	+ 0·596	+ 0·794	+ 0·607	− 0·780
584	h	1054	16 43	+ 52	146 17 35	20 46	− 3 11	− 0·976	− 0·832	− 0·555	+ 0·786
586	h	1051	31 14	+ 57	146 32 11	36 24	− 4 13	− 1·289	− 0·834	− 0·551	+ 0·814
588	g	692	23 30	+ 3	152 23 33	28 54	− 5 21	− 1·076	− 0·886	− 0·463	+ 0·053
590	g	692	37 39	+ 5	152 37 44	38 6	− 0 22	− 0·074	− 0·888	− 0·460	+ 0·063
592	g	692	42 19	+ 6	152 42 25	45 22	− 2 57	− 0·595	− 0·889	− 0·459	+ 0·075
594	g	691	50 28	+ 7	152 50 35	54 5	− 3 30	− 0·704	− 0·890	− 0·456	+ 0·085
598	g	690	18 11	+ 10	153 18 21	18 3	+ 0 18	+ 0·060	− 0·893	− 0·449	+ 0·116
600	g	690	20 21	+ 11	153 20 31	28 11	− 7 40	− 1·540	− 0·894	− 0·449	+ 0·131
602	g	690	31 45	+ 11	153 31 56	34 24	− 2 28	− 0·496	− 0·895	− 0·446	+ 0·139
604	g	689	39 53	+ 12	153 40 5	42 38	− 2 33	− 0·511	− 0·896	− 0·444	+ 0·151
608	f	192	3 16	− 35	44 2 41	12 20	− 9 39	− 0·539	+ 0·719	− 0·695	+ 0·801
610	f	190	37 9	− 35	43 36 34	48 22	−11 48	− 0·652	+ 0·724	− 0·690	+ 0·784
612	f	188	19 48	− 35	43 19 13	31 4	−11 51	− 0·648	+ 0·728	− 0·686	+ 0·770
614	f	183	17 3	− 36	42 16 27	41 17	−24 50	− 1·322	+ 0·740	− 0·673	+ 0·730
616	f	181	5 54	− 36	42 5 18	24 6	−18 48	− 0·990	+ 0·742	− 0·670	+ 0·717
618	f	180	56 11	− 36	41 55 35	67 31	−11 56	− 0·625	+ 0·744	− 0·668	+ 0·704
620	f	130	28 25	− 8	28 28 17	55 23	−27 6	− 1·024	+ 0·879	− 0·477	+ 0·097
622	f	128	38 49	− 6	27 38 43	82 10	−43 27	− 1·617	+ 0·886	− 0·464	+ 0·070
624	f	125	49 20	+ 0	26 49 20	64 20	−15 0	− 0·545	+ 0·892	− 0·451	+ 0·025
626	f	123	45 21	+ 4	25 45 25	69 6	−23 41	− 0·847	+ 0·901	− 0·434	− 0·013
628	f	123	9 22	+ 6	25 69 28	47 43	+21 45	+ 0·778	+ 0·898	− 0·441	− 0·015
630	f	121	46 52	+ 9	24 47 1	75 55	−28 54	− 1·017	+ 0·908	− 0·419	− 0·048
632	f	335	5 25	− 21	261 65 4	55 22	+ 9 42	+ 0·945	− 0·138	+ 0·990	− 0·697
634	f	337	58 11	− 23	261 57 48	50 43	+ 7 5	+ 0·694	− 0·139	+ 0·990	− 0·695
636	f	339	54 31	− 25	261 54 6	46 59	+ 7 7	+ 0·702	− 0·141	+ 0·990	− 0·690
638	f	340	50 48	− 26	261 50 22	42 54	+ 7 28	+ 0·739	− 0·142	+ 0·990	− 0·687

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XIII_{25}	644	f	Aug. 10.....	E	·61143	291 40 56·26	− 5 5 1·30	+2·356	−7·189	+31·90	+ 8·95
	646	e			·61621	40 54·64	5 2·20	+2·140	−7·195	+31·88	+ 8·83
	648	e			·62032	40 53·24	5 2·96	+1·952	−7·200	+31·88	+ 8·83
	650	f			·62535	40 51·54	5 3·90	+1·720	−7·205	+31·90	+ 8·95
	652	f			·63057	40 49·77	5 4·88	+1·475	−7·209	+31·90	+ 8·95
	654	e			·63387	40 48·65	5 5·50	+1·321	−7·211	+31·87	+ 8·84
	656	e			·63774	40 47·34	5 6·22	+1·139	−7·215	+31·87	+ 8·84
	658	f			·64273	40 45·65	5 7·16	+0·904	−7·219	+31·90	+ 8·96
XIII_{27}	660	f	Aug. 11.....	E	·57491	291 35 42·91	− 5 8 5·61	+3·799	−7·105	+31·86	+ 9·00
	662	e			·58086	35 41·06	8 6·78	+3·551	−7·114	+31·83	+ 8·89
	664	e			·58404	35 40·07	8 7·40	+3·416	−7·121	+31·83	+ 8·89
	666	f			·58802	35 38·83	8 8·17	+3·248	−7·129	+31·86	+ 9·00
	668	f	(2)		·59531	35 36·57	8 9·60	+2·932	−7·141	+31·86	+ 9·00
	670	c			·59882	35 35·48	8 10·29	+2·779	−7·147	+31·83	+ 8·89
	672	e			·60186	35 34·54	8 10·89	+2·644	−7·151	+31·83	+ 8·89
	674	f			·60539	35 33·45	8 11·58	+2·488	−7·156	+31·86	+ 9·00
XIII_{28}	676	e	Aug. 16.....	E	·56856	291 16 15·91	− 5 25 53·12	+3·369	−6·961	+31·52	+ 9·14
	678	e			·57224	16 15·34	25 53·96	+3·213	−6·969	+31·52	+ 9·14
	680	e	(2)		·57513	16 14·90	25 54·63	+3·095	−6·974	+31·52	+ 9·14
	682	e			·57827	16 14·41	25 55·35	+2·961	−6·980	+31·52	+ 9·14
XIII_{29}	688	e	Aug. 16.....	E	·71675	291 15 53·32	− 5 26 27·33	−3·234	−6·962	+31·51	+ 9·15
	690	e			·72112	15 52·67	26 28·34	−3·414	−6·953	+31·51	+ 9·15
	692	e	(2)		·72554	15 52·00	26 29·36	−3·593	−6·946	+31·51	+ 9·15
	694	e			·73023	15 51·30	26 30·45	−3·782	−6·935	+31·51	+ 9·15
XV_{19}	736	d	Aug. 22.....	E	·70214	291 10 42·33	− 5 51 0·81	−3·202	−6·748	+30·97	+ 9·28
	738	d			·70718	10 42·56	51 2·11	−3·400	−6·736	+30·97	+ 9·28
	740	d			·71110	10 42·75	51 3·12	−3·551	−6·728	+30·97	+ 9·28
	742	d			·71439	10 42·91	51 3·97	−3·678	−6·721	+30·97	+ 9·28
	744	d			·71720	10 43·04	51 4·70	−3·783	−6·713	+30·97	+ 9·28

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
644	f	1098	18 48	— 5	249 18 43	16 34	+ 2 9	+ 0·687	— 0·353	+ 0·936	— 0·756
646	e	1316	6 55	— 33	44 6 22	9 21	— 2 59	— 1·142	+ 0·718	— 0·696	+ 0·654
648	e	1314	4 34	— 33	44 4 1	7 45	— 3 44	— 1·427	+ 0·719	— 0·695	+ 0·640
650	f	1104	17 18	— 10	249 17 8	14 49	+ 2 19	+ 0·744	— 0·354	+ 0·935	— 0·735
652	f	1106	17 58	— 11	249 17 47	14 10	+ 3 37	+ 1·163	— 0·353	+ 0·935	— 0·726
654	e	1309	1 56	— 32	44 1 24	2 39	— 1 15	— 0·476	+ 0·719	— 0·695	+ 0·596
656	e	1307	58 33	— 32	43 58 1	61 11	— 3 10	— 1·204	+ 0·720	— 0·694	+ 0·583
658	f	1111	15 28	— 15	249 15 13	12 39	+ 2 34	+ 0·829	— 0·354	+ 0·935	— 0·707
660	f	1455	50 59	+ 6	246 51 5	48 59	+ 2 6	+ 0·889	— 0·393	+ 0·919	— 0·802
662	e	972	33 21	— 42	38 32 39	34 34	— 1 55	— 0·542	+ 0·782	— 0·623	+ 0·720
664	e	970	30 31	— 42	38 29 49	32 52	— 3 3	— 0·861	+ 0·783	— 0·623	+ 0·712
666	f	1460	49 18	— 1	246 49 17	47 40	+ 1 37	+ 0·687	— 0·394	+ 0·919	— 0·783
668	f	1463	50 6	— 3	246 50 3	46 57	+ 3 6	+ 1·319	— 0·393	+ 0·919	— 0·771
670	e	965	23 27	— 39	38 22 48	24 51	— 2 3	— 0·575	+ 0·783	— 0·621	+ 0·662
672	e	964	19 59	— 38	38 19 21	23 10	— 3 49	— 1·070	+ 0·784	— 0·620	+ 0·648
674	f	1467	47 56	— 7	246 47 49	45 54	+ 1 55	+ 0·818	— 0·394	+ 0·919	— 0·756
676	e	634	5 34	— 9	241 5 25	1 25	+ 4 0	+ 0·738	— 0·484	+ 0·875	— 0·771
678	e	635	4 43	— 10	240 64 33	59 17	+ 5 16	+ 0·973	— 0·484	+ 0·875	— 0·765
680	e	635	2 3	— 11	240 61 52	57 33	+ 4 19	+ 0·798	— 0·484	+ 0·875	— 0·759
682	e	636	58 46	— 12	240 58 34	55 45	+ 2 49	+ 0·521	— 0·485	+ 0·874	— 0·753
688	e	676	44 39	— 42	239 43 57	40 41	+ 3 16	+ 0·642	— 0·504	+ 0·864	— 0·439
690	e	677	39 47	— 43	239 39 4	38 25	+ 0 39	+ 0·128	— 0·505	+ 0·863	— 0·428
692	e	678	39 11	— 45	239 38 26	36 8	+ 2 18	+ 0·454	— 0·506	+ 0·863	— 0·419
694	e	679	36 19	— 46	239 35 33	33 41	+ 1 52	+ 0·369	— 0·506	+ 0·862	— 0·407
736	d	585	32 43	— 10	287 32 33	28 57	+ 3 36	+ 0·613	+ 0·301	+ 0·953	— 0·739
738	d	584	27 29	— 13	287 27 16	21 46	+ 5 30	+ 0·934	+ 0·300	+ 0·954	— 0·744
740	d	584	19 37	— 15	287 19 22	16 13	+ 3 9	+ 0·535	+ 0·298	+ 0·955	— 0·748
742	d	584	14 4	— 18	287 13 46	11 32	+ 2 14	+ 0·379	+ 0·296	+ 0·955	— 0·750
744	d	584	11 58	— 20	287 11 38	7 32	+ 4 6	+ 0·697	+ 0·296	+ 0·955	— 0·753

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TABLE H.—LEIPZIG POSITION-ANGLES,

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
II_{13}	25	θ	June 18.....	P	·57475	300 30 23·30	− 7 37 5·72	+0·757	−8·194	+23·53	+ 4·46
	26	μ	(2)		·58713	30 20·08	36 59·12	+0·284	−8·201	+23·38	+ 4·98
III_{37}	28	λ	June 19.....	P	·49995	300 26 9·77	− 7 28 56·94	+3·334	−8·107	+23·70	+ 4·72
III_{38}	32	λ	June 20.....	P	·49316	300 21 9·32	− 7 20 21·27	+3·474	−8·134	+24·03	+ 4·85
	33	λ	(2)		·50709	21 4·91	20 14·11	+3·017	−8·172	+24·03	+ 4·85
	35	λ			·54776	20 51·96	19 53·20	+1·566	−8·249	+24·05	+ 4·85
III_{39}^{*}	50	θ	June 24.....	P	·46862	299 56 20·55	− 6 47 38·87	+3·943	−8·242	+25·42	+ 5·22
	51	θ	(2)		·48000	56 15·66	47 33·50	+3·586	−8·277	+25·42	+ 5·22
	52	θ			·49287	56 10·12	47 27·44	+3·155	−8·306	+25·43	+ 5·23
	53	θ			·51093	56 2·33	47 18·92	+2·518	−8·347	+25·43	+ 5·23
III_{40}	60	θ	June 25.....	P	·45843	299 49 1·63	− 6 39 57·57	+4·176	−8·256	+25·71	+ 5·34
	63	θ	(1)		·48649	48 48·81	39 44·66	+3·282	−8·333	+25·72	+ 5·34
	64	θ			·50317	48 41·17	39 36·99	+2·701	−8·369	+25·73	+ 5·35
	67	θ			·53881	48 24·85	39 20·61	+1·366	−8·422	+25·74	+ 5·35
V_{23}	103	z	July 7	P	·45625	297 50 44·76	− 5 23 49·35	+3·146	−8·641	+28·98	+ 6·50
	106	z	(3)		·49029	50 20·93	23 39·34	+1·839	−8·693	+28·99	+ 6·50
VI_{14}	107	x	July 9	P	·42336	297 27 25·32	− 5 14 40·58	+4·076	−8·615	+29·46	+ 6·65
	108	y			·43517	27 16·79	14 37·46	+3·676	−8·640	+29·38	+ 6·68
	109	y	(1)		·44662	27 8·52	14 34·45	+3·272	−8·664	+29·38	+ 6·68
	110	x			·45748	27 0·66	14 31·59	+2·870	−8·684	+29·47	+ 6·65
	111	x			·46915	26 52·23	14 28·52	+2·426	−8·702	+29·47	+ 6·65
	112	y			·48074	26 43·85	14 25·48	+1·969	−8·716	+29·38	+ 6·68

*III_{39} Was rejected for discordance in first solution, and inadvertently overlooked in the second.

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COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	′ ″	° ′ ″	′ ″	′ ″	″			
25	θ	3489	10 54	+ 1 12	138 12 6	12 30	− 0 24	− 0·406	− 0·745	− 0·667	+ 0·490
26	μ	6246	17 0	+ 1 1	333 18 1	18 9	− 0 8	− 0·242	+ 0·893	+ 0·449	− 0·343
28	λ	1064	60 14	− 0 37	240 59 37	56 2	+ 3 35	+ 1·109	− 0·485	+ 0·875	− 0·870
32	λ	1228	56 54	+ 1 31	269 58 25	56 25	+ 2 0	+ 0·715	− 0·001	+ 1·000	− 0·816
33*	λ	1233	18 12	+ 1 10	270 19 22	16 17	+ 3 5	+ 1·106	+ 0·005	+ 1·000	− 0·816
35	λ	1248	16 30	+ 0 32	271 17 2	13 30	+ 3 32	+ 1·283	+ 0·024	+ 1·000	− 0·821
50	θ	473	29 34	− 2 7	39 27 27	25 5	+ 2 22	+ 0·326	+ 0·772	− 0·636	+ 0·826
51	θ	473	32 47	− 1 57	38 30 50	31 19	− 0 29	− 0·067	+ 0·782	− 0·623	+ 0·795
52	θ	475	37 45	− 1 47	37 35 58	30 30	+ 5 28	+ 0·756	+ 0·792	− 0·610	+ 0·755
53	θ	476	10 45	− 1 36	36 9 9	5 19	+ 3 50	+ 0·531	+ 0·807	− 0·590	+ 0·696
60	θ	837	42 29	− 1 42	350 40 47	40 0	+ 0 47	+ 0·191	+ 0·987	+ 0·162	+ 0·276
63	θ	852	56 7	− 0 49	349 55 18	54 8	+ 1 10	+ 0·289	+ 0·985	+ 0·175	+ 0·175
64	θ	861	30 33	− 0 28	349 30 5	27 21	+ 2 44	+ 0·685	+ 0·983	+ 0·183	+ 0·111
67	θ	881	32 9	+ 0 5	348 32 14	31 43	+ 0 31	+ 0·132	+ 0·980	+ 0·199	− 0·035
103	z	696	5 39	+ 1 32	295 7 11	1 52	+ 5 19	+ 1·076	+ 0·426	+ 0·906	− 0·649
106	z										
107	x	1315	34 33	+ 0 45	76 35 18	37 38	− 2 20	− 0·893	+ 0·232	− 0·973	+ 0·932
108	y	1756	56 14	− 0 41	236 55 33	54 7	+ 1 26	+ 0·732	− 0·546	+ 0·838	− 0·924
109	y	1762	10 53	− 0 43	237 10 10	8 13	+ 1 57	+ 1·000	− 0·542	+ 0·840	− 0·904
110	x	1292	56 43	+ 0 9	75 56 52	58 39	− 1 47	− 0·670	+ 0·243	− 0·970	+ 0·911
111	x	1284	42 28	+ 0 1	75 42 29	45 0	− 2 31	− 0·940	+ 0·245	− 0·969	+ 0·902
112	y	1779	52 15	− 0 47	237 51 28	49 49	+ 1 39	+ 0·854	− 0·531	+ 0·847	− 0·843

* III_{34} No. 33. One of the readings in this observation has been altered 10′ in accordance with a note made by the observer as probably requisite. This note was overlooked in the preliminary reduction (where all single distances are excluded). In this preliminary reduction the value of O–C for 33 was + 0″·329 instead of + 1″·106.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VIII_{22}	122	q	July 21.....	P	·40686	294 57 10·60	− 4 41 9·88	+3·302	−8·698	+31·37	+ 7·70
	123	q			·41757	57 2·60	41 9·12	+2·902	−8·714	+31·37	+ 7·70
	124	q			·43558	56 49·14	41 7·84	+2·205	−8·738	+31·37	+ 7·70
	125	q			·44661	56 40·90	41 7·06	+1·763	−8·748	+31·37	+ 7·70
IX_{14}	129	p	July 24.....	P	·39768	294 20 32·38	− 4 38 47·25	+3·267	−8·670	+31·63	+ 7·91
	131	q	(2)		·41724	20 18·29	38 46·78	+2·533	−8·699	+31·67	+ 7·98
XI_{26}	147	m	July 31.....	P	·38074	293 2 44·53	− 4 41 55·65	+3·010	−8·553	+32·02	+ 8·37
	148	m	(1)		·39364	2 36·72	41 56·63	+2·528	−8·572	+32·02	+ 8·37
XI_{27}	156	m	July 31..... (1)	P	·52692	293 1 16·25	− 4 42 6·85	−2·814	−8·559	+32·02	+ 8·39
XI_{28}	162	m	Aug. 1	P	·49873	292 51 41·09	− 4 43 28·44	−1·847	−8·566	+32·06	+ 8·46
	163	k	(2)		·51257	51 33·05	43 29·68	−2·385	−8·552	+32·00	+ 8·47
	164	k			·52969	51 23·11	43 31·23	−3·026	−8·527	+32·00	+ 8·47
	165	m			·54735	51 12·86	43 32·83	−3·650	−8·497	+32·06	+ 8·46
*	168	f	Aug. 7	P	·52696	292 0 42·04	− 4 56 6·81	−3·514	−8·326	+31·99	+ 8·76
	171	f			·56778	0 24·58	56 13·30	−4·753	−8·234	+31·99	+ 8·76
XIII_{30}	172	f	Aug. 10.....	P	·36834	291 42 19·71	− 5 4 16·04	+2·221	−8·285	+31·91	+ 8·94
	173	e	(3)		·37926	42 15·92	4 18·06	+1·807	−8·297	+31·89	+ 8·82
XIII_{31}	180	e	Aug. 12.....	P	·35366	291 31 50·02	− 5 10 40·14	+2·517	−8·203	+31·79	+ 8·93
	181	e	(2)		·36310	31 47·31	10 42·04	+2·174	−8·216	+31·79	+ 8·93
XV_{20}	219	d	Aug. 25.....	P	·43955	291 14 58·48	− 6 2 58·28	−2·008	−7·665	+30·64	+ 9·37
	222	d	(2)		·46506	15 2·05	3 5·05	−2·848	−7·622	+30·64	+ 9·37
	223	d			·47849	15 3·95	3 8·61	−3·262	−7·595	+30·64	+ 9·37

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	′ ″	° ′ ″	′ ″	′ ″	″			
122	q	497	8 9	− 1 15	44 6 54	12 42	− 5 48	− 0·839	+ 0·716	− 0·697	+ 0·842
123	q	492	23 54	− 1 13	43 22 41	27 4	− 4 23	− 0·627	+ 0·726	− 0·688	+ 0·809
124	q	483	3 48	− 1 9	42 2 39	8 3	− 5 24	− 0·758	+ 0·741	− 0·671	+ 0·749
125	q	478	13 33	− 1 7	41 12 26	18 7	− 5 41	− 0·790	+ 0·751	− 0·660	+ 0·710
129	p	1314	29 2	+ 1 25	106 30 27	33 13	− 2 46	− 1·058	− 0·284	− 0·959	+ 0 738
131	q	1925	1 46	+ 1 8	285 2 54	1 9	+ 1 45	+ 0·980	+ 0·260	+ 0·966	− 0·775
147	m	723	6 6	− 1 29	18 4 37	6 14	− 1 37	− 0·340	+ 0·950	− 0·311	+ 0·551
148	m	720	30 17	− 1 16	17 29 1	30 13	− 1 12	− 0·251	+ 0·953	− 0·301	+ 0·498
156	m	689	54 45	+ 0 24	10 55 9	57 42	− 2 33	− 0·511	+ 0·982	− 0·190	− 0·112
162	m	740	25 36	+ 1 11	323 26 47	25 13	+ 1 34	+ 0·337	+ 0·803	+ 0·596	− 0·659
163	k	805	24 30	+ 1 17	145 25 47	27 47	− 2 0	− 0·468	− 0·823	− 0·567	+ 0·680
164	k	801	6 4	+ 1 28	146 7 32	8 48	− 1 16	− 0·295	− 0·830	− 0·557	+ 0·726
165	m	755	25 3	+ 1 34	321 26 37	24 6	+ 2 31	+ 0·553	+ 0·782	+ 0·624	− 0·815
168	f	208		− 1 13		40 32					
171	f	190		− 1 22		7 41					
172	f	1005	0 29	− 0 15	250 0 14	57 28	+ 2 46	+ 0·819	− 0·342	+ 0·940	− 0·855
173	e	1403	16 24	− 1 7	45 15 17	17 34	− 2 17	− 0·932	+ 0·704	− 0·710	+ 0·716
180	e	712	45 25	− 1 25	31 44 0	46 20	− 2 20	− 0·483	+ 0·850	− 0·527	+ 0·645
181	e	708	37 53	− 1 19	31 36 34	38 41	− 2 7	− 0·436	+ 0·851	− 0·525	+ 0·616
219	d	621	9 15	− 0 38	209 8 37	2 35	+ 6 2	+ 1·090	− 0·873	+ 0·485	− 0·198
222	d	625	37 15	− 0 26	208 36 49	31 36	+ 5 13	+ 0·948	− 0·877	+ 0·478	− 0·116
223	d	628	19 11	− 0 17	208 18 54	15 13	+ 3 41	+ 0·673	− 0·880	+ 0·473	− 0·074

* Nos. 168, 171. Wrong star observed.

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TABLE I.—GÖTTINGEN POSITION-ANGLES,

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
III_{33}	5	λ	June 20.....	S	·46815	300 21 17·25	— 7 20 34·13	+4·396	—8·050	+24·02	+ 4·84
	6	λ			·48897	21 10·65	20 23·42	+3·802	—8·119	+24·03	+ 4·84
III_{34}*	11	λ	June 21.....	S	·49439	300 15 36·96	— 7 11 51·30	+3·563	—8·181	+24·36	+ 4·97
	12	λ			·51483	15 29·86	11 41·00	+2·889	—8·234	+24·36	+ 4·97
	15	θ			·56749	15 11·55	11 14·46	+0·963	—8·317	+24·51	+ 4·85
	16	θ			·58287	15 6·18	11 6·73	+0·365	—8·325	+24·52	+ 4·86
III_{35}	23	θ	June 24.....	S	·49066	299 56 11·07	— 6 47 28·48	+3·443	—8·301	+25·43	+ 5·22
	24	θ			·50663	56 4·18	47 20·94	+2·903	—8·339	+25·43	+ 5·23
III_{36}	29	θ	June 25.....	S	·49232	299 48 46·14	— 6 39 41·98	+3·303	—8·346	+25·72	+ 5·35
	30	θ			·50800	48 38·96	39 34·77	+2·761	—8·381	+25·72	+ 5·35
VI_{15}	41	y	July 9.....	S	·42720	297 27 22·55	— 5 14 39·56	+4·157	—8·629	+29·37	+ 6·68
	42	x			·44452	27 10·03	14 35·00	+3·576	—8·663	+29·46	+ 6·65
	43	x			·46174	26 57·58	14 30·47	+2·954	—8·700	+29·47	+ 6·65
	44	y			·48521	26 40·62	14 24·30	+2·057	—8·731	+29·38	+ 6·68
VI_{16}	50	x	July 10.....	S	·44178	297 15 4·36	— 5 10 20·20	+3·566	—8·677	+29·66	+ 6·76
	51	x			·46883	14 44·54	10 13·51	+2·570	—8·726	+29·67	+ 6·76
XI_{29}	62	m	July 31.....	S	·45794	293 1 57·86	— 4 42 1·54	+0·214	—8·631	+32·02	+ 8·38
	63	m			·47313	1 48·68	42 2·71	—0·401	—8·628	+32·02	+ 8·38
	70	m			·63097	0 13·69	42 15·01	—5·681	—8·355	+32·03	+ 8·39

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COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
5	λ	1219	21 25	+175	269 24 20	20 23	+ 3 57	+ 1·402	− 0·010	+ 1·000	− 0·809
6	λ	1226	49 41	+114	269 51 35	50 27	+ 1 8	+ 0·404	− 0·002	+ 1·000	− 0·813
11	λ	1639	3 28	+134	288 5 42	4 25	+ 1 17	+ 0·612	+ 0·311	+ 0·951	− 0·668
12	λ	1650	18 47	+103	288 20 30	19 44	+ 0 46	+ 0·368	+ 0·315	+ 0·949	− 0·691
15	θ	1766	28 8	+ 76	126 29 24	28 48	+ 0 36	+ 0·308	− 0·595	− 0·804	+ 0·612
16	θ	1757	22 8	+ 73	126 23 21	23 33	− 0 12	− 0·102	− 0·594	− 0·804	+ 0·648
23	θ	474	44 29	−117	37 40 2	42 2	− 2 0	− 0·276	+ 0·791	− 0·612	+ 0·776
24	θ	476	23 26	−105	36 21 41	26 47	− 5 6	− 0·706	+ 0·805	− 0·592	+ 0·726
29	θ	855	44 23	− 50	349 43 33	45 35	− 2 2	− 0·506	+ 0·984	+ 0·178	+ 0·174
30	θ	864	21 59	− 30	349 21 29	20 39	+ 0 50	+ 0·209	+ 0·982	+ 0·185	+ 0·114
41	y	1752	46 48	− 40	236 46 8	44 1	+ 2 7	+ 1·078	− 0·548	+ 0·836	− 0·948
42	x	1301	12 29	+ 27	76 12 56	13 47	− 0 51	− 0·322	+ 0·238	− 0·971	+ 0·926
43	x	1289	52 20	+ 11	75 52 31	53 53	− 1 22	− 0·513	+ 0·244	− 0·970	+ 0·916
44	y	1781	57 39	− 48	237 56 51	54 57	+ 1 54	+ 0·984	− 0·531	+ 0·848	− 0·850
50	x	781	46 13	− 82	43 44 51	45 51	− 1 0	− 0·227	+ 0·722	− 0·692	+ 0·858
51	x	772	17 25	− 75	42 16 10	18 41	− 2 31	− 0·565	+ 0·740	− 0·673	+ 0·777
62	m	704	25 33	− 34	14 24 59	26 15	− 1 16	− 0·259	+ 0·969	− 0·249	+ 0·235
63	m	700	43 2	− 24	13 42 38	41 18	+ 1 20	+ 0·272	+ 0·971	− 0·237	+ 0·166
70	m	671	27 56	+384	5 34 20	37 14	− 2 54	− 0·566	+ 0·995	− 0·097	− 0·482

* III_{34} Unsymmetrical; a long delay between observations of λ and θ; therefore rejected.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
XII_{29}	76	g	Aug. 5.....	S	·43851	292 16 36·09	− 4 50 57·99	+0·358	−8·497	+32·00	+ 8·67
	77	g			·45505	16 28·07	51 0·25	−0·299	−8·496	+32·00	+ 8·68
XII_{30}	83	f	Aug. 8.....	S	·53054	291 53 46·32	− 4 58 50·95	−3·481	−8·311	+31·96	+ 8·82
	84	f			·54846	53 39·15	58 53·97	−4·052	−8·277	+31·96	+ 8·82
XIII_{32}	87	f	Aug. 10.....	S	·39251	291 42 11·33	− 5 4 20·51	+1·557	−8·320	+31·91	+ 8·94
	88	e			·41286	42 4·30	4 24·28	+0·762	−8·333	+31·89	+ 8·82
	89	e			·42927	41 58·64	4 27·33	+0·116	−8·336	+31·89	+ 8·82
	90	f			·45316	41 50·40	4 31·78	−0·823	−8·332	+31·91	+ 8·95
XIII_{33}	94	e	Aug. 16.....	S	·38489	291 16 44·89	− 5 25 10·89	+1·134	−8·102	+31·53	+ 9·13
	95	e			·39491	16 43·29	25 13·19	+0·751	−8·106	+31·53	+ 9·13
XV_{21}	112	d	Aug. 22.....	S	·51661	291 10 34·07	− 5 50 12·95	−3·989	−7·694	+30·99	+ 9·27
XV_{22}	114	d	Aug. 25.....	S	·47744	291 15 3·80	− 6 3 8·33	−3·014	−7·626	+30·64	+ 9·37
	115	d			·49487	15 6·26	3 12·96	−3·533	−7·590	+30·63	+ 9·37

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Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
76	g	714	58 52	+ 55	145 59 47	61 25	— 1 38	— 0·339	— 0·829	— 0·559	+ 0·445
77	g	711	41 23	+ 58	146 42 21	42 13	+ 0 8	+ 0·028	— 0·836	— 0·549	+ 0·492
83	f	266	20 52	— 85	281 19 27				+ 0·196	+ 0·981	— 0·883
84	f	274	44 7	—117	101 42 10				— 0·203	— 0·979	+ 0·893
87	f	1015	57 32	— 24	249 57 8	53 36	+ 3 32	+ 1·043	— 0·343	+ 0·939	— 0·834
88	e	1390	6 54	— 65	45 5 49	6 36	— 0 47	— 0·317	+ 0·706	— 0·708	+ 0·644
89	e	1383	0 57	— 65	44 59 52	60 59	— 1 7	— 0·449	+ 0·707	— 0·707	+ 0·598
90	f	1040	48 5	— 51	249 47 14	44 56	+ 2 18	+ 0·696	— 0·346	+ 0·938	— 0·753
94	e	591	20 53	— 43	243 20 10	15 40	+ 4 30	+ 0·774	— 0·449	+ 0·894	— 0·775
95	e	594	11 15	— 47	243 10 28	8 51	+ 1 37	+ 0·279	— 0·451	+ 0·892	— 0·757
112	d	609	25 28	— 26	291 25 2	26 31	— 1 29	— 0·263	+ 0·365	+ 0·931	— 0·862
114	d	628	17 14	— 23	208 16 51	15 23	+ 1 28	+ 0·268	— 0·881	+ 0·474	— 0·098
115	d	631	52 30	— 10	207 52 20	54 14	— 1 54	— 0·349	— 0·884	+ 0·467	— 0·044

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TABLE K.—BAMBERG POSITION-ANGLES,

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
						° ′ ″	° ′ ″	″	″	″	″
VI_{17}	4	w	July 11.....	Hg	·54528	297 1 30·92	− 5 5 56·55	−0·818	−8·609	+29·85	+ 6·84
	5	x			·57872	1 6·11	5 48·85	−2·219	−8·581	+29·78	+ 6·88
VII_{31}	6	t	July 18.....	Hg	·53634	295 33 18·43	− 4 45 40·51	−1·433	−8·618	+31·01	+ 7·49
	11	t			·61812	32 16·22	45 30·95	−4·563	−8·487	+31·02	+ 7·50
VIII_{23}	12	q	July 20.....	Hg	·55600	295 7 48·95	− 4 42 16·28	−2·522	−8·582	+31·27	+ 7·61
	17	q			·63029	6 53·04	42 10·01	−5·140	−8·434	+31·28	+ 7·62
VIII_{24}	19	q	July 22.....	Hg	·55957	294 42 53·90	− 4 39 58·34	−2·926	−8·565	+31·48	+ 7·80
	22	q			·63565	41 57·75	39 54·34	−5·467	−8·399	+31·49	+ 7·81
XI_{30}	23	m	July 31.....	Hg	·52781	293 1 15·71	− 4 42 6·92	−2·774	−8·413	+32·02	+ 8·39
	28	m			·61595	0 22·71	42 13·83	−5·603	−8·216	+32·03	+ 8·39
XI_{31}	29	k	Aug. 1.....	Hg	·49742	292 51 41·85	− 4 43 28·32	−1·680	−8·420	+32·00	+ 8·47
	30	m			·51699	51 30·49	43 30·08	−2·468	−8·400	+32·06	+ 8·46
	31	m			·53269	51 21·37	43 31·50	−3·074	−8·376	+32·06	+ 8·46
	32	k			·54984	51 11·42	43 33·07	−3·703	−8·346	+32·00	+ 8·47
XII_{31}	33	g	Aug. 4.....	Hg	·50258	292 24 21·24	− 4 48 54·82	−2·251	−8·329	+32·00	+ 8·61
	34	i			·52408	24 10·29	48 57·55	−3·077	−8·298	+32·09	+ 8·63
	35	i			·54399	24 0·17	49 0·08	−3·792	−8·260	+32·09	+ 8·63
	36	g			·56976	23 47·09	49 3·35	−4·626	−8·203	+32·00	+ 8·62

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COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle Corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C on Great Circle.	f_p'	f_p''	f_p'''
		″	′ ″	″	° ′ ″	′ ″	′ ″	″			
4	w	1038	59 24	+ 54	147 60 18	57 45	+ 2 33	+ 0·770	− 0·848	− 0·530	+ 0·525
5	x	888	17 14	+ 63	340 18 17	14 15	+ 4 2	+ 1·042	+ 0·941	+ 0·338	− 0·498
6	t	799	39 15	− 14	271 39 1	33 18	+ 5 43	+ 1·329	+ 0·027	+ 1·000	− 0·866
11	t	864	8 56	− 96	272 7 20	4 48	+ 2 32	+ 0·637	+ 0·036	+ 0·999	− 0·864
12	q	1019	29 12	− 60	73 28 12	28 16	− 0 4	− 0·020	+ 0·285	− 0·959	+ 0·751
17	q	966	6 40	−169	72 3 51	7 15	− 3 24	− 0·955	+ 0·307	− 0·952	+ 0·646
19	q	668	49 54	+ 52	309 50 46	46 45	+ 4 1	+ 0·781	+ 0·640	+ 0·768	− 0·845
22	q	717	2 27	+ 40	307 3 6	2 33	+ 0 34	+ 0·118	+ 0·603	+ 0·798	− 0·999
23	m	689	55 25	+ 21	10 55 46	55 9	+ 0 37	+ 0·124	+ 0·982	− 0·189	− 0·112
28	m	674	15 0	+225	6 18 45	22 34	− 3 49	− 0·748	+ 0·994	− 0·111	− 0·464
29	k	810	51 23	+ 60	144 52 23	51 2	+ 1 21	+ 0·318	− 0·818	− 0·576	+ 0·622
30	m	746	42 9	+ 67	322 43 16	39 49	+ 3 27	+ 0·749	+ 0·795	+ 0·606	− 0·705
31	m	751	3 12	+ 72	322 4 24	0 40	+ 3 44	+ 0·816	+ 0·788	+ 0·615	− 0·756
32	k	795	52 34	+ 88	146 55 17	57 4	− 1 47	− 0·413	− 0·838	− 0·545	+ 0·764
33	g	979	33 58	+ 31	118 34 29	34 58	− 0 29	− 0·138	− 0·478	− 0·878	+ 0·838
34	i	1224	23 37	+ 43	305 24 20	20 45	+ 3 35	+ 1·276	+ 0·579	+ 0·816	− 0·855
35	i	1232	59 45	+ 39	304 60 24	57 38	+ 2 46	+ 0·992	+ 0·573	+ 0·819	− 0·892
36	g	952	59 2	+ 9	120 0 26	64 37	− 4 11	− 1·159	− 0·501	− 0·865	+ 0·940

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CHAPTER II.

DETERMINATION OF A PRELIMINARY SYSTEM OF WEIGHTS.

Observations of Distance.

Auwers (Cape).

When the square of the accidental *mean error* is determined by the agreement of the different observations in the same set, the following values are found for Auwers' measures of distance.

(The number of observations on which each result depends is denoted by figures enclosed in brackets).

Distance.	0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
$\varepsilon\varepsilon$	0·0439 (82)	0·0290 (60)	0·1072 (49)	0·0794 (44)
Mean Distance.	510″	1080″	3000″	5050″

or, if subdivided according to the quality of definition,

Definition.	Good (1)	Tolerable (2)	Bad (3)
$\varepsilon\varepsilon$	0·0785 (49)	0·0416 (100)	0·0917 (86)
Mean Distance.	2910″	1930″	1640″

But Auwers' habit of bisection appears to be affected by reversal of the prism, especially when the images are faint (in which case he did not always equalize the brilliancy of star and planet with the screens, because one more easily visible image seemed in such circumstances to aid his power of making bisections), and, as such personality is eliminated in the mean of the two positions of the prism, it is necessary to discuss the value of ε on this assumption. In connection with his observations of August 21, Auwers makes the following note:—"No screen was used because the different images would have been too faint together. There may therefore, on account of the considerable inequality of the two objects in brightness, be a considerable personality, which can only be eliminated by taking the mean of observations made in two positions of the prism."

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The results confirm the observer's suspicion, thus

	O–C.	Mean.
Star e	$-0''\cdot430$	
	prism reversed	$-0''\cdot601$
	$-0''\cdot772$	
	$-1''\cdot263$	
	prism reversed	$-0''\cdot415$
	$+0''\cdot433$	
Star b	$+0''\cdot624$	
	prism reversed	$+0''\cdot005$
	$-0''\cdot614$	
	$-0''\cdot439$	
	prism reversed	$+0''\cdot114$
	$+0''\cdot668$	

	εε for 1 observation without regard to mean of two positions of prism	εε for 1 observation derived from agreement of the results in mean of two positions of the prism
Star e	0·5104	0·0346
„ b	0·4637	0·0121

There is no other instance in which the observer has made a similar note, and only in this instance was the effect of reversal of the prism taken into account in computing Auwers' *mean error* of observation. It seemed, however, desirable, for similar reasons, to re-discuss the whole of Auwers' observations, having regard to the effect of reversal of the prism—that is, to derive the *mean error* of an observation free from the effects of reversal of the prism.

The results are—

Distance.	0″ to 750″	750″ to 1500″	1500″ to 4000″	4000 and upwards.
εε	0·0507 (32)	0·0298 (23)	0·0519 (19)	0·0837 (34)
Mean Distance.	500″	1070″	3010″	5250″

or, arranged according to definition,—

Definition.	Good (1)	Tolerable (2)	Bad (3)
εε	0·0781 (24)	0·0416 (46)	0·0617 (38)
Mean Distance.	3940″	2340″	1950″

If in the above result εε is assumed the same for all classes of observation, its mean value is

$$\varepsilon\varepsilon = 0{\cdot}0568,$$

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whereas if $\varepsilon\varepsilon$ is similarly derived, neglecting the effect of reversal of the prism, the mean value is

$$\varepsilon\varepsilon = 0{\cdot}0676,$$

showing that a mean error of $\pm$ 0″·104 is eliminated in the case of Auwers' observations by symmetrical use of the reversing prism. The second series of results must therefore be accepted.

It now appears that when the reversing prism is utilized the accuracy of Auwers' results is not affected by the quality of the definition. This is borne out in nearly every well marked case where the observer has noted unusual faintness or bad definition of the images. Much extra care and time are taken, and often the pointing repeated two or three times, so that a general level of accuracy is secured.

The larger error for the best definition is due to the fact that Auwers' records of finest definition occur more frequently in the measurement of the larger distances, and the errors undoubtedly increase as the distances increase from 1000″. For distances less than 1000″ the errors also increase, the difficulty of "crossing through" seeming to influence the accuracy of pointing—a fact sometimes noted by the observer.

The following values of $\varepsilon\varepsilon$ have been adopted for Auwers' measures of distance:—

For Distances	100″	$\varepsilon\varepsilon$ = 0·0600
	500	·0480
	1000	·0350
	2000	·0350
	3000	·0500
	4000	·0650
	5000	·0820
	6000	·0880

Gill (Cape).

The squares of the accidental *mean errors*, classed by distance only, are—

Distance	0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
$\varepsilon\varepsilon$	0·0467	0·0506	0·0514	0·0510

or, classed according to definition—

Definition.	Good (1)	Tolerable (2)	Bad (3)
$\varepsilon\varepsilon$	0·0441	0·0463	0·0688

These figures refer to the *mean error* of an observation of four pointings, without regard to the direction of the reversing prism.

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The mean value of εε without regard to classification is 0·0500 ; or, if regard is paid to the position of the reversing prism, and weight 2 is given to a result derived from the mean of observations in the two positions of the prism, the value of εε is 0·0515 for an observation of weight 1, or practically identical with that derived from observations in any position of the prism.

The accidental error does not seem to depend in any sensible degree on the distance, and to vary sensibly in the worst kind of definition only.

For definition (1) and (2) the adopted value of εε is 0·0450, and for definition (3) 0·0688.

Elkin and Hall (Yale).

The observing conditions at Yale are generally of medium quality, in some cases undescribed, and neither in Elkin's nor Hall's observations can any definite connection be traced between the amount of accidental error and the quality of definition.

Dividing the observations according to distance we have—

Distances.		0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
Elkin εε	=	0·1509 (69)	0·2055 (48)	0·1183 (32)	0·3363 (37)
Hall εε	=	0·2204 (36)	0·2674 (16)	0·1106 (6)	0·3431 (7)

There is a curious similarity in the apparent relative accuracy of both observers for different distances ; but, notwithstanding this, it is not easy to imagine that distances of 1500″ to 4000″ are really measured by these observers with three times the weight of distances of 4000″ and upwards, and at the same time that distances from 0″ to 1500″ are measured with a weight nearly intermediate between the two.

Under these circumstances it appears the safest plan, at least as a preliminary step, to assign like weights to all the distances, viz., those corresponding to the mean values—

	εε
For Elkin - - - - -	0·1963.
Hall - - - - -	0·2505.

Peter (Leipzig). Distances and Position-Angles.

The square of the accidental *mean error* for a single observation (4 pointings) in distance is—

Distance.		0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
εε	=	0·0592 (15)	0·0478 (16)	0·0545 (21)	0·0744 (19)

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and, when arranged according to quality of definition—

Definition.		Good (1)	Tolerable (2)	Bad (3)
$\varepsilon\varepsilon$	=	0·0622 (35)	0·0745 (32)	0·0400 (4)

It does not seem possible to establish any law for the variation of precision. There is a slight increase in the values of $\varepsilon\varepsilon$ for distances beyond 4000″, but this is not well established. The mean value of $\varepsilon\varepsilon$, viz., 0·0610, is provisionally adopted for all Dr. Peter's observations of distance.

The mean value of $\varepsilon\varepsilon$ for Dr. Peter's observations in position-angle reckoned in seconds of arc on the great circle, viz., 0·0595, is so nearly the same as for his observations of distance, that the same Table of weights may be used for both.

Schur (Göttingen). Distances and Position-Angles.

There is not a sufficient number of observations to permit an accurate estimation of the accidental error for various distances.

Combining all the measures of distance as of equal weight, the value of $\varepsilon\varepsilon$ is = 0·1092.

Similarly, for the position-angles, we have—

$$\varepsilon\varepsilon = 0{\cdot}1164.$$

Hartwig (Bamberg). Distances and Position-Angles.

There are so very few observations of distance, and of these few only three which are repeated more than once, that the observed data are quite inadequate to determine the *mean error*.

There are eight position-angles which are measured twice, and these give a *mean error* corresponding to—

$$\varepsilon\varepsilon = 0{\cdot}2634.$$

The three distances which have been observed twice give—

$$\varepsilon\varepsilon = 0{\cdot}0177$$

which, however, cannot alone be accepted as sufficient proof of greater accuracy in the distances. On the whole, it has been considered safest, as a preliminary step, to rank the Bamberg Observations with those of Elkin at Yale.

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AUWERS (CAPE). POSITION-ANGLES.

The results for $\varepsilon\varepsilon$ are—

Distance.		0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
$\varepsilon\varepsilon$	=	0·0335 (30)	0·0283 (13)	0·0441 (8)	0·2087 (3)

Definition.		Good (1)	Tolerable (2)	Bad (3)
$\varepsilon\varepsilon$	=	0·0345 (19)	0·0600 (13)	0·0292 (13)

On the whole, Auwers' position-angles appear to be practically of the same accuracy as his observations of distance, to be independent of the quality of the definition, and to follow nearly the same law of relative accuracy for different distances. The same Table of weights may, therefore, be considered applicable both to the distances and position-angles.

GILL (CAPE). POSITION-ANGLES.

The results are—

Distance.		0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
$\varepsilon\varepsilon$	=	0·0619 (26)	0·0337 (8)	0·1182 (7)	0·0573 (2)

Definition.		Good (1)	Tolerable (2)	Bad (3)
$\varepsilon\varepsilon$	=	0·0505 (26)	0·0779 (10)	0·1792 (7)

The observations have for definition (1) and (2) nearly the same accuracy as those of Dr. Auwers' measures of distance, but $\varepsilon\varepsilon$ is about twice as great for definition (3). For Gill's position-angles, therefore, the weights applicable to Auwers' observations are adopted for definition (1) and (2), with half weight when the definition is (3).

ELKIN (YALE). POSITION-ANGLES.

The results are—

Distance.		0″ to 750″	750″ to 1500″	1500″ to 4000″	4000″ and upwards.
$\varepsilon\varepsilon$	=	0·1326 (61)	0·1000 (39)	0·3743 (4)	Nil.

The weight of the result 0·3743 is so small that it cannot be regarded as a proof of greater error.

The mean value of $\varepsilon\varepsilon$, having regard to the weights, is—

$$\varepsilon\varepsilon = 0{\cdot}1297$$

and this is provisionally adopted as a measure of accuracy of all Elkin's measures of position-angle.

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HALL (YALE). POSITION-ANGLES.

The mean value $\epsilon\epsilon$ = 0·4191 is adopted.

SYSTEMATIC ERRORS.

Besides the accidental errors, allowance must be made for constant or systematic errors which are not diminished by any number of observations.

In connection with the distances the most obvious of these sources of systematic error are—

1. Outstanding errors of division of the scale.
2. Errors of the star's place.
3. Errors of the ephemeris.

The first of this class of errors may almost be neglected in the case of the Cape Heliometer (as will be readily seen by inspection of the details of the results of the division-error investigation given in the introduction to the Heliometer Observations, Vol. II., Introduction, p. 41), but a *mean error* of ± 0″·02 is adopted.

For the Yale Heliometer only the error of each tenth division of the scale has been investigated, and the accidental *mean error* is assumed to be ± 0″·04.

For the Göttingen Heliometer the division-error has been investigated for each division, but with a somewhat lower accuracy than for the Cape instrument; a *mean error* of ± 0″·03 has been adopted.

In the Leipzig instrument, so far as I am aware, no investigation of the scale has been made, and no corrections have been applied to the observations. Judging from the accuracy of the Cape scales, also divided by Repsolds, the *mean error* is about ± 0″·06; this, and a like *mean error* for the Bamberg Heliometer, have been adopted.

For the *mean error* of the star's place in any direction the value $\sqrt{0{\cdot}0020}$, based on the probable errors of the definitive star-places given in Chap. X of the Triangulation, is adopted.

The ephemeris of the planet has been computed from the elements with 7-figure logarithms, and α, δ, and log. Δ were computed for every second day and interpolated for the intermediate day.

As 7-figure logarithms are insufficient to represent the elements to 0″·01, a *mean error* of ± 0″·03 has been assumed on this account.

For the position-angles the only sources of constant error which have been allowed for are the *mean error* of the place of the star of comparison and the accidental *mean error* of the ephemeris, both estimated as above.

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With these data the following Tables of Weights have been computed.

TABLE OF WEIGHTS applicable to AUWERS' Observations of DISTANCE and POSITION-ANGLE in all circumstances of Definition. To GILL'S Observations of POSITION-ANGLE, Definition (1) and (2); and, *with half weight*, to Gill's POSITION-ANGLES, Definition (3).

Distance.	100″	500″	1000″	2000″	3000″	4000″	5000″	6000″
	p	p	p	p	p	p	p	p
No. of Obs. 1	0·63	0·78	1·04	1·04	0·75	0·59	0·47	0·44
2	1·20	1·47	1·92	1·92	1·41	1·12	0·90	0·85
3	1·72	2·07	2·67	2·67	2·00	1·60	1·31	1·23
4	2·19	2·61	3·31	3·31	2·53	2·04	1·68	1·58
5	2·61	3·10	3·89	3·89	3·01	2·45	2·03	1·91
6	3·01	3·54	4·40	4·40	3·45	2·84	2·35	2·22
7	3·36	3·92	4·82	4·82	3·85	3·18	2·67	2·52
8	3·70	4·30	5·20	5·20	4·17	3·51	2·94	2·80
9	4·00	4·65	5·56	5·56	4·49	3·81	3·23	3·05
10	4·30	4·94	5·88	5·88	4·82	4·08	3·48	3·31

GILL'S OBSERVATIONS OF DISTANCE.

	Definition (1) and (2).	Definition (3).		Definition (1) and (2).	Definition (3).
	p	p		p	p
No. of Obs. 1	0·83	0·55	No. of Obs. 6	3·70	2·70
2	1·55	1·06	7	4·12	3·05
3	2·19	1·53	8	4·49	3·36
4	2·74	1·95	9	4·82	3·67
5	3·25	2·33	10	5·13	3·92

YALE OBSERVATIONS.

	ELKIN.			HALL.	
	Distances.	Position-Angles.		Distances.	Position-Angles.
	p	p		p	p
No. of Obs. 1	0·20	0·30	No. of Obs. 1	0·16	0·09
2	0·39	0·59	2	0·31	0·19
3	0·57	0·87	3	0·45	0·28
4	0·75	1·13	4	0·60	0·37
5	0·91	1·39	5	0·73	0·47
6	1·07	1·63	6	0·86	0·55
7	1·23	1·87	7	1·00	0·64
8	1·38	2·09	8	1·12	0·72
9	1·52	2·31	9	1·24	0·81
10	1·66	2·52	10	1·35	0·89

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LEIPZIG OBSERVATIONS.—PETER.

	Distances and Position-Angles.
	p
No. of Obs. 1	0·59
2	1·08
3	1·49
4	1·83
5	2·14

GÖTTINGEN OBSERVATIONS.—SCHUR.

	Distances.	Position-Angles.
	p	p
No. of Obs. 1	0·35	0·33
2	0·69	0·65
3	1·00	0·94
4	1·29	1·22

BAMBERG OBSERVATIONS.—HARTWIG.

Same Tables as Elkin.

These tabular weights are probably greater than they should be, because the discussion of the Triangulation shews that there are peculiarities in certain stars (probably due to colour), which produce small constant errors, the effect of which is to increase the *mean error* by an amount which cannot be estimated *a priori*. It seems desirable, therefore, in the first place only to take into account such errors as can be estimated with reasonable accuracy beforehand, leaving the rest for discussion at a later stage of the work.

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CHAPTER III.

FORMATION OF THE EQUATIONS OF CONDITION FROM EPHEMERIS I. AND THEIR DISCUSSION.

Distances.

The equations of condition are readily formed from the Tables of Chapter I., pp. 270–381.

Let $x' = \Delta\alpha' \cos. \delta$, $y' = \Delta\delta'$ } Where $\Delta\alpha'$ and $\Delta\delta'$ are respectively the required corrections of the Tabular R.A. and Declination.

z = the number of tenth parts that the value of the adopted parallax should be increased ;

then the appropriate factors of x', y' and z are given in columns 21, 22 and 23 respectively of these tables, and, if the scale-value were known, we should have for any observation of distance—

$$f'x' + f''y' + f'''z = \text{O–C}$$

where the value of O–C is given in Column 20.

But the tabular distances of Chapter I. have been computed *not* with the definitive star-places derived from the Triangulation, but with the only places available at the time when the work was done, viz., the places derived by Dr. Auwers from his discussion of the meridian observations. (Triangulation pp. 116, 117). The first step is therefore to correct the equations for the errors of the adopted star-places, by aid of the values of x and y derived from the discussion of the Triangulation (Table XVI., Column III., Chap. X., pp. 222, 223). The factors of x and y are numerically the same as those of x' and y', but with opposite sign, hence the corrections to O–C on account of x and y are—

$$= f'x + f''y.$$

But, as has been shewn in Chap. I. of the Triangulation (pp. 9–11), the scale-value cannot be regarded as uniform at different times, and must be determined for each set of observations from the result of simultaneous observations of the Standard Stars ; or, in the case when two distances on opposite sides of the planet are observed, its effect

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can, by proper methods, be eliminated. But it is also shewn in Chap. X., pp. 233–237, of the Triangulation, that, besides a correction for scale-value proportional to the distance, observers with modern Heliometers seem to require a further correction, especially for short distances, because they measure s cos. ψ instead of s, and their observations therefore require a correction $= s$ (sec. $\psi - 1$) or $= \frac{\kappa^2}{2s}$, where ψ is the angle through which the position-circle is turned + and − from the true position-angle in the process of "crossing" the images; or κ is the angle between the images of the artificial double star which is formed in the process of "crossing" the images.

Thus the complete correction for scale-value involves the introduction of two terms, the co-efficient of one of which is proportional to the distance, and the co-efficient of the other proportional to the reciprocal of the distance, that is of the form

$$s\,\Delta\sigma + \frac{1}{s}\,\mathrm{N}$$

where $\Delta\sigma$ must be considered different in each set of observations, and N must be considered different for each observer, and, perhaps, also for different conditions of the images.

Further, it cannot be assumed that x' and y' are constant for any considerable period, but if the observations are divided into groups not exceeding six or seven days each, it may be safely assumed that the variation of x' and y' can be developed in terms of t and t^2, where t is the time reckoned from the mean epoch of the group in which the equation occurs.

Therefore, if for x' we write $x' + a\,t + b\,t^2$

and for y' $\quad y' + a't + b't^2$

the complete equation from each observation of distance becomes

$$f'x' + f''y' + f'''z + f'ta + f''tb + f't^2a' + f''t^2b' = \text{O–C} + s\,\Delta\sigma + \frac{1}{s}\mathrm{N}$$

For convenience s is put $= \dfrac{\text{the distance in seconds of arc}}{1000}$

and $\quad \Delta\sigma =$ the correction for scale-value in 1000″;

and for N (the term depending on the reciprocal of s) will be substituted the initial of the observer, with a suffix, such as A_3, E_2, indicating the quality of the observing conditions.

The suffix 1 will be employed when the observing conditions are *good*, that is when the "Images" and "Steadiness" are from 1 to 2–3, and the images are not very faint by haze—in the latter case the suffix 2 will be used.

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The suffix 2 refers to *indifferent* conditions, when the Images are about 3, or, if better, are faint.

The suffix 3 refers to *bad* observing conditions, when the Images and Steadiness are 3–4 or 4, or, if 3, are faint from haze.

Thus, for example, the observations of Set 2, Group III., made by Gill on June $21^{d}.46$ B.M.T. (that is $t = -0.54$, because the epoch of Group III. is June 22·0), after being corrected for the errors of the adopted star-places, furnish, in the mean, the equations—

Star θ.

$$+0.80x' - 0.60y' + 0.13z - 0.43a + 0.32b + 0.23a' - 0.17b' = -0''.881 + 1.82\Delta\sigma + 0.55G_2$$

Star λ.

$$-0.95x' + 0.31y' - 0.33z + 0.51a - 0.17b - 0.28a' + 0.09b' = +0''.249 + 1.63\Delta\sigma + 0.61G_2$$

The next step is to eliminate the term $\Delta\sigma$.

The sum of the equations is—

$$-0.15x' - 0.29y' - 0.20z + 0.08a + 0.15b - 0.05a' - 0.08b' = -0''.632 + 3.45\Delta\sigma + 1.16G_2$$

Substituting the value of $\Delta\sigma$ (derived from the above equation, in terms of the absolute and symbolical quantities) in either of the equations for star θ or λ, we get—

$$+0.88x' - 0.45y' + 0.24z - 0.47a + 0.24b + 0.26a' - 0.13b' = -0''.547 - 0.06G_2$$

and this equation, with the weight of both, is therefore employed to represent the observations of Set III_2.

In any set where the distance of the planet has been measured only from one star, the original equation is computed precisely in the same manner; but the corresponding numerical value of $\Delta\sigma$ derived from the nearly simultaneous observation of Standard Stars (Chap. I., pp. 254–257) is substituted. Thus, for example, in the Set III_1 made by Gill June $19^{d}.42$ B.M.T., the mean of the equations from the three observations of distance from the star λ furnishes the equation—

$$-0.85x' - 0.52y' - 0.82z + 2.19a + 1.34b - 5.66a' - 3.46b' = -0''.290 + 1.06\Delta\sigma + 0.94G_1$$

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But from the results of Table XVI., column III., chap. IX., of the Victoria Triangulation, pp. 222–3, the star λ requires the corrections—

$$x = +\ 0''\cdot112\ ;\ y = +\ 0''\cdot013$$

and the value of $\Delta\sigma$ from the observations of the Standard Stars, p. 254, is—

$$\Delta\sigma = +\ 0''\cdot017\ ;$$

thus the right hand side of the definitive equation becomes—

$$= -\ 0''\cdot38 + 0\cdot94\ G_1$$

But it is shewn in the Triangulation (p. 232) that the Standard Stars, apparently in consequence of a difference of colour, are observed differently by different observers, and hence a small term, depending upon the distance, and peculiar to each observer, may be introduced. This term will be denoted by a, g, e, h, s, and h_g for Auwers, Gill, Elkin, Hall, Schur and Hartwig respectively.*

The complete equation, from the above example, will thus become—

$$-\ 0\cdot85x' - 0\cdot52y' - 0\cdot82z + 2\cdot91a + 1\cdot34b - 5\cdot66a' - 3\cdot46b' = -\ 0''\cdot38 + 1\cdot06g + 0\cdot94\ G_1$$

Position-Angles.

The equations resulting from the observations of position-angle are readily derived from the Tables of Chapter I.

In column 20 are given the values of O–C in position-angle, and in the adjacent column 21 the corresponding quantities reckoned in arc on the great circle. The factors of x', y' and z are given in columns 22, 23 and 24 respectively. But it is practically impossible to determine all the constants of the Heliometer stand on every night of observation, and it is shewn in Chapter VIII. of the Triangulation (p. 164) that it is more accurate to determine the index-error at each epoch of observation by reference to Standard Stars (or two opposite stars) than to assume the constancy of the adjustment for longer periods, notwithstanding the fact that its mean adjustments remain very constant during long periods. There is no form of equatoreal mounting in which Δp is not liable to variation of several seconds of arc in short periods. The heat of the observer's body, or a current of air slightly different in temperature from that of the room, are sufficient to produce such a change on a metallic stand, because the stand cannot in all its parts be protected from these influences by wooden or other covers (as may be done in the case of a Transit-pier), nor can their effects be eliminated by reversal as is done in such instruments as the Vertical Circle.

* These latter terms are omitted in the equations which follow on p. 396 *et seq.*

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The form of the equation thus becomes—

$$f_p' x' + f_p'' y' + f_p''' z = (\text{O–C}) + f \Delta p$$

where f_p', f_p'', f_p''' are the factors given respectively in columns 22, 23 and 24 ;

O–C is taken from column 21 ;

and the factor of Δp (the required correction of the zero of the position-circle in seconds of arc) is = the observed distance in seconds of arc (given in column 15) × sin 1″.

Take for example the observations of Set 22, Group III., where the position-angle of Victoria was measured from the stars θ and λ on June $21^{d}\cdot42$ B.M.T. (i.e. $t. = -0^{d}\cdot58$).

The mean tabular values of O–C from column 21 are $-0''\cdot629$ and $+0''\cdot557$ for the stars θ and λ respectively, and these values when corrected for the errors of the star-places become respectively $-0''\cdot664$ and $+0''\cdot603$.

Introducing the terms a, b, a', b', the equations become—

Star θ.

$$-0\cdot60x' - 0\cdot80y' - 0\cdot77z + 0\cdot35a + 0\cdot46b - 0\cdot20a' - 0\cdot27b' = -0''\cdot664 + 0\cdot0089\Delta p$$

Star λ.

$$+0\cdot30x' + 0\cdot95y' + 0\cdot76z - 0\cdot17a - 0\cdot55b + 0\cdot10a' + 0\cdot32b' = +0''\cdot603 + 0\cdot0078\Delta p$$

The sum of these equations gives—

$$-0\cdot30x' + 0\cdot15y' - 0\cdot01z + 0\cdot18a - 0\cdot09b - 0\cdot10a' + 0\cdot05b' = -0''\cdot061 + 0\cdot0167\Delta p$$

Substituting the value of Δp (derived from the above equation in terms of the absolute and symbolical quantities) either equation gives—

$$0\cdot44x' + 0\cdot88y' + 0\cdot76z - 0\cdot25a - 0\cdot51b + 0\cdot15a' + 0\cdot30b' = +0''\cdot631.$$

The equation thus formed is employed (with a weight equal to twice the weight of one of the original equations) to represent the results of Set 22 Group III. When position-angles have been measured only from one star, the original equation is computed precisely in the same manner ; and then, since the effect of an error in the adopted zero of the position-circle cannot be eliminated, the numerical value of Δp is substituted from the nearly simultaneous observations of the Standard Stars (Chap. I., pp 258–262).

The resulting equations, computed by these methods, are given in the accompanying Tables.

To save space the co-efficients of the unknown quantities are given in tabular form.

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GROUP I.

Epoch, June 11d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.	p	v
										DISTANCES—CAPE.		
I. 1	June 10·71	κ μ	+ ·83	− ·56	− ·63	− ·24	+ ·16	+ ·07	− ·05	−0·03″ − ·04 G_2	3·10	+0·25″
										DISTANCES—GÖTTINGEN.		
I. 2	11·58	κ μ	+ ·84	− ·52	+ ·55	+ ·48	− ·31	+ ·28	− ·18	−0·14 + ·07 S	0·70	+0·16

GROUP II.

Epoch, June 17d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.	p	v
										DISTANCES—CAPE.		
II. 1	15·70	μ θ	− ·53	+ ·85	+ ·63	+ ·68	−1·11	− ·89	+ 1·44	+0·40 + ·02 A_3	1·80	−0·20
2	17·70	μ θ	− ·56	+ ·82	+ ·68	− ·39	+ ·57	− ·27	+ ·40	+ ·81 − ·08 A_3	3·36	+ ·18
3	18·71	μ θ	− ·59	+ ·79	+ ·71	−1·01	+1·35	−1·73	+ 2·31	+ ·59 − ·13 G_1	5·48	− ·05
										DISTANCES—LEIPZIG.		
II. 4	17·48	μ θ	− ·55	+ ·83	− ·87	− ·27	+ ·40	− ·13	+ ·19	+0·53 − ·06 P	2·16	−0·10
5	18·52	μ θ	− ·58	+ ·80	− ·80	− ·88	+1·22	−1·35	+ 1·85	+ ·54 − ·12 P	3·66	− ·09
										DISTANCES—YALE.		
II. 6	17·75	μ θ	− ·56	+ ·82	− ·78	− ·42	+ ·62	− ·32	+ ·46	+1·05 − ·08 H_2	1·20	+0·42
7	18·73	μ θ	− ·59	+ ·79	− ·80	−1·03	+1·37	−1·77	+ 2·37	+0·76 − ·13 E_2	1·50	+ ·09
										DISTANCES—GÖTTINGEN.		
II. 8	18·56	μ θ	− ·59	+ ·80	− ·74	− ·92	+1·25	−1·43	+ 1·95	+0·90 − ·13 S	0·70	+0·22
										POSITION-ANGLES—CAPE.		
II. 9	16·49	μ θ	+ ·84	+ ·53	+ ·60	− ·43	− ·27	+ ·22	+ ·14	+0·49 A_2	1·80	+0·16
10	17·47	μ θ	+ ·82	+ ·55	+ ·66	+ ·39	+ ·26	+ ·18	+ ·12	+ ·40 G_2	1·80	+ ·06
11	18·44	μ θ	+ ·80	+ ·58	+ ·77	+1·15	+ ·84	+1·66	+ 1·21	+ ·34 A_2	1·80	·00
										POSITION-ANGLES—LEIPZIG.		
II. 12	18·58	μ θ	+ ·80	+ ·59	− ·44	+1·26	+ ·93	+1·99	+ 1·47	+0·16 P	1·18	−0·19

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GROUP III.

Epoch, June 22^{d}·0.

Distances—Cape.

Set.	t	Stars.	x'	y'	z	a	b	a'	b'	O–C.		p	v
	June									″			″
III. 1	19·42	λ	− ·85	− ·52	− ·82	+2·19	+1·34	−5·66	− 3·46	−0·38	+ ·94 G_1	2·19	+0·01
2	21·46	θ λ	+ ·88	− ·45	+ ·24	− ·47	+ ·24	+ ·26	− ·13	− ·55	− ·06 G_2	3·10	− ·11
3	22·46	θ λ	+ ·88	− ·47	+ ·22	+ ·40	− ·22	+ ·18	− ·10	− ·77	+ ·33 A_2	3·84	− ·27
4	22·70	θ λ	+ ·90	− ·44	− ·78	+ ·63	− ·31	+ ·44	− ·22	− ·36	+ ·47 G_2	1·66	+ ·14
5	23·45	θ	+ ·99	− ·15	+ ·46	+1·44	− ·22	+2·08	− ·31	− ·43	+1·37 G_2	2·74	− ·06
6	25·67	θ	− ·25	+ ·97	+ ·60	− ·92	+3·56	−3·37	+13·07	+ ·57	+1·03 A_2	1·92	− ·09

Distances—Yale.

III. 7	20·73	λ	− ·99	+ ·09	− ·49	+1·26	− ·11	−1·60	+ ·14	−0·44	+ ·76 E_2	0·75	−0·22
8	20·80	λ	− ·99	+ ·12	− ·18	+1·19	− ·14	−1·43	+ ·17	− ·41	+ ·75 H_2	0·45	− ·25
9	22·73	θ λ	+ ·89	− ·45	+ ·68	+ ·65	− ·33	+ ·47	− ·24	− ·84	+ ·47 E_2	1·50	− ·25
10	22·77	θ λ	+ ·90	− ·44	+ ·51	+ ·69	− ·34	+ ·53	− ·26	− ·54	+ ·50 H	0·62	− ·02
11	23·77	θ	+1·00	+ ·06	+ ·17	+1·77	+ ·11	+3·13	+ ·19	− ·98	+1·69 E_2	0·75	− ·33
12	23·87	θ	+ ·99	+ ·15	− ·36	+1·85	+ ·28	+3·46	+ ·52	− ·03	+1·82 H_2	0·31	+ ·36

Distances—Leipzig.

III. 13	20·52	λ	−1·00	+ ·01	− ·25	+1·48	− ·01	−2·19	+ ·02	+0·23	+ ·81 P	1·08	0·00
14	21·46	θ λ	+ ·88	− ·45	+ ·73	− ·47	+ ·24	+ ·25	− ·13	− ·19	− ·06 P	1·18	+ ·25
15	22·52	θ λ	+ ·88	− ·47	+ ·61	+ ·46	− ·24	+ ·24	− ·13	− ·34	+ ·36 P	3·66	+ ·13
16	24·57	θ	+ ·52	+ ·85	− ·70	+1·34	+2·18	+3·43	+ 5·61	+ ·23	+2·08 P	1·08	− ·37
17	25·49	θ	− ·18	+ ·98	− ·87	− ·63	+3·42	−2·19	+11·93	+ ·92	+1·16 P	1·83	+ ·09

Distances—Göttingen.

III. 19	22·58	θ λ	+ ·89	− ·46	+ ·43	+ ·52	− ·27	+ ·30	− ·16	−0·44	+ ·39 S	1·38	+0·20
20	24·47	θ	+ ·63	+ ·77	− ·38	+1·56	+1·90	+3·84	+ 4·70	− ·63	+2·12 S	0·69	− ·24
21	25·47	θ	− ·17	+ ·99	− ·88	− ·59	+3·44	−2·05	+11·92	+ ·57	+1·19 S	0·69	+ ·23

Position-Angles—Cape.

III. 22	21·42	θ λ	+ ·44	+ ·88	+ ·76	− ·25	− ·51	+ ·15	+ ·30	+0·63	G_2	3·84	+0·03
23	22·44	θ λ	+ ·47	+ ·88	+ ·70	+ ·21	+ ·39	+ ·09	+ ·17	+ ·56	A_1	3·84	− ·04
24	22·69	θ λ	+ ·45	+ ·89	+ ·17	+ ·31	+ ·62	+ ·22	+ ·43	+ ·51	G_1	3·84	− ·10
25	23·49	θ	− ·13	− ·99	− ·48	− ·19	−1·48	− ·29	− 2·20	−1·01	G_2	1·47	− ·28

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GROUP III—*continued.*

Epoch, June 22d·0. POSITION-ANGLES—YALE.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
	June									″			″
III. 27	20·73	λ	+ ·09	+1·00	− ·67	− ·11	−1·27	+ ·14	+1·61	+0·62	E	1·13	−0·11
28	20·80	λ	+ ·12	+ ·99	− ·71	− ·14	−1·19	+ ·17	+1·43	+ ·85	H	0·55	+ ·13
29	22·73	θ λ	+ ·44	+ ·89	− ·46	+ ·33	+ ·65	+ ·23	+ ·47	+ ·58	E	2·26	− ·03
30	22·77	θ λ	+ ·44	+ ·90	− ·56	+ ·34	+ ·69	+ ·26	+ ·53	+ ·36	H	0·38	− ·26
31	23·77	θ	+ ·06	−1·00	+ ·74	+ ·11	−1·77	+ ·19	−3·13	− ·51	E	2·09	+ ·25
32	23·87	θ	+ ·15	− ·99	+ ·68	+ ·28	−1·85	+ ·52	−3·46	− ·96	H	0·37	− ·19
						POSITION-ANGLES—GÖTTINGEN.							
III. 33	20·48	λ	− ·01	+1·00	− ·81	+ ·01	−1·52	− ·02	+2·31	+0·59	S	0·65	−0·15
34	21·54	θ λ	+ ·45	+ ·88	− ·66	− ·20	− ·41	+ ·09	+ ·19	+ ·24	S	1·30	− ·35
35	24·50	θ	+ ·80	− ·60	+ ·75	+2·00	−1·50	+ 5·00	−3·75	− ·69	S	·65	− ·14
36	25·50	θ	+ ·98	+ ·18	+ ·14	+3·43	+ ·63	+12·00	+2·20	− ·42	S	·65	− ·45
						POSITION-ANGLES—LEIPZIG.							
III. 37	19·50	λ	− ·48	+ ·87	− ·87	+1·21	−2·19	− 3·03	+5·46	+1·02	P	0·59	+0·33
38	20·51	λ	+ ·01	+1·00	− ·82	− ·01	−1·49	+ ·02	+2·22	+1·05	P	1·49	+ ·31
40	25·50	θ	+ ·98	+ ·18	+ ·13	+3·43	+ ·63	+12·00	+2·20	+0·31	P	1·83	+ ·28

GROUP IV.

Epoch. June 29d·0. DISTANCES—CAPE.

IV. 1	26·42	ε λ	+ ·62	− ·75	+ ·01	−1·50	+1·95	+ 4·11	−5·04	−0·63	− ·02 A_2	3·36	+0·01
2	26·66	ι ζ	+ ·27	+ ·97	+ ·32	− ·63	−2·26	+ 1·46	+5·27	+1·00	+ ·03 G_2	3·10	+ ·27
3	27·44	ι ζ	+ ·25	+ ·97	+ ·61	− ·40	−1·51	+ ·62	+2·35	+0·86	+ ·02 G_2	5·48	+ ·11
4	27·68	ε λ	+ ·55	− ·80	− ·72	− ·73	+1·06	+ ·95	−1·39	− ·70	+ ·06 A_2	3·36	− ·03
5	28·43	η ζ	+ ·01	+1·00	+ ·40	·00	− ·57	·00	+ ·32	+ ·94	− ·04 A_1	3·36	+ ·14
6	28·69	γ λ	+ ·57	− ·78	− ·78	− ·18	+ ·24	+ ·06	− ·07	− ·88	·00 G_1	5·48	− ·23
7	29·44	η ζ	+ ·04	+1·00	+ ·51	+ ·02	+ ·44	+ ·01	+ ·19	+ ·76	− ·07 G_1	5·48	− ·05
8	29·67	γ λ	+ ·52	− ·81	− ·71	+ ·34	− ·54	+ ·23	− ·36	− ·68	+ ·02 A_1	3·16	− ·01
9	30·43	ε δ	+ ·14	+ ·98	+ ·57	+ ·20	+1·40	+ ·29	+2·00	+ ·80	+ ·08 A_1	5·06	·00
10	30·68	y θ	+ ·71	− ·70	− ·81	+1·19	−1·18	+ 2·00	−1·99	− ·60	− ·07 G_1	5·48	− ·03
	July												
11	1·44	ε δ	+ ·12	+ ·99	+ ·54	+ ·20	+2·41	+ ·70	+5·94	+ ·88	− ·02 G_2	2·12	+ ·05
12	1·68	y θ	+ ·72	− ·70	− ·83	+1·93	−1·86	+ 5·17	−4·99	− ·74	·00 A_2	3·36	− ·18
13	2·42	η α	+ ·60	+ ·80	+ ·75	+2·04	+2·73	+ 6·97	+9·34	+ ·76	+ ·01 A_2	4·08	+ ·05
1	2·68	y θ	+ ·72	− ·70	− ·84	+2·65	−2·58	+ 9·73	−9·49	−0·71	+ ·05 G_2	3·90	− ·15

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GROUP IV.—*continued.*

Epoch, June 29d·0. DISTANCES—LEIPZIG.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.	p	v
	June									″		″
IV. 15	26·47	ε λ	+ ·61	— ·75	+ ·85	—1·55	+1·91	+3·91	— 4·83	—0·53 — ·02 P	3·66	+0·11
16	28·50	γ λ	+ ·58	— ·77	+ ·80	— ·29	+ ·38	+ ·14	— ·19	— ·42 — ·02 P	2·16	+ ·22
17	29·46	γ λ	+ ·53	— ·80	+ ·86	+ ·25	— ·37	+ ·11	— ·17	— ·61 + ·02 P	1·18	+ ·05
18	30·48	y θ	+ ·71	— ·71	+ ·81	+1·05	—1·05	+1·55	— 1·56	— ·58 — ·08 P	3·66	·00
						DISTANCES—YALE.						
IV. 19	26·74	ε λ	+ ·60	— ·76	+ ·74	—1·36	+1·74	+3·06	— 3·92	—0·65 ·00 E_2	1·82	0·00
20	27·70	ε λ	+ ·55	— ·80	+ ·83	— ·71	+1·04	+ ·93	— 1·35	— ·64 + ·06 E	1·50	+ ·05
21	29·71	γ λ	+ ·52	— ·81	+ ·79	+ ·36	— ·57	+ ·26	— ·40	—0·56 + ·02 E	1·50	+ ·12
22	29·76	η ζ	+ ·05	+ ·99	— ·73	+ ·04	+ ·75	+ ·03	+ ·57	+1·07 — ·08 E_2	1·50	+ ·24
						DISTANCES—GÖTTINGEN.						
IV. 23	26·48	ε λ	+ ·61	— ·75	+ ·85	—1·55	+1·90	+3·89	— 4·79	—0·88 — ·02 S	1·38	—0·25
						DISTANCES—BAMBERG.						
IV. 24	26·57	ε λ	+ ·61	— ·76	+ ·65	—1·48	+1·84	+3·61	—4·46	—0·31 — ·01 H_g	0·40	+0·34

GROUP V.

Epoch, July 6d·0. DISTANCES—CAPE.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.	p	v
	July											
V. 1	3·65	β δ	+ ·35	— ·93	— ·69	— ·83	+2·19	+1·94	— 5·16	—0·61 — ·03 A_2	4·08	+0·17
2	4·41	γ a	+ ·31	+ ·95	+ ·67	— ·49	—1·52	+ ·77	+ 2·41	+ ·96 + ·02 A_1	4·08	+ ·10
4	5·47	z	+ ·92	— ·39	+ ·09	— ·49	+ ·21	+ ·26	— ·11	— ·22 +1·27 G_1	2·74	+ ·18
6	8·41	x	+1·00	+ ·02	+ ·53	+2·41	+ ·05	+5·81	+ ·12	+ ·22 — ·23 A_1	3·31	+ ·12
	8·41	y	— ·52	— ·86	— ·71	—1·25	—2·07	—3·02	— 5·00	— ·86 + ·18 A_1	3·31	·00
	8·41	z	— ·91	+ ·41	— ·26	—2·19	+ ·99	—5·29	+ 2·38	+ ·39 + ·18 A_1	3·31	+ ·08

V 3. D.M. — 4°·4982 observed instead of β.

V 6. The scale-value (Δσ) is obtained by solving the three equations which result from the measures of the Stars x, y, z, viz., Δσ = + 0·058 — ·368 A; the equations are corrected with this value of Δσ.

						DISTANCES—LEIPZIG.						
V. 8	7·47	z	— ·91	+ ·42	— ·59	—1·34	+ ·62	—1·96	+ ·91	—0·06 +1·41 P	1·08	—0·42

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GROUP V.—*continued.*

Epoch, July 6d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
DISTANCES—YALE.													
	July									″			″
V. 9	4·72	β δ	+ ·32	− ·93	+ ·79	− ·41	+1·19	+ ·53	− 1·53	−0·79	+ ·04 E_2	2·14	+0·01
10	5·80	z	+ ·92	− ·39	+ ·22	− ·18	+ ·08	− ·04	− ·02	− ·49	+1·82 H_2	0·31	+ ·16
13	7·67	z	− ·91	+ ·42	− ·73	−1·52	+ ·70	−2·54	+ 1·17	− ·19	+1·16 H_1	0·86	− ·17
14	7·76	z	− ·91	+ ·41	− ·36	−1·60	+ ·72	−2·82	+ 1·27	− ·45	+1·08 E_1	1·07	− ·32
DISTANCES—GÖTTINGEN.													
V. 15	4·46	β δ	+ ·34	− ·93	+ ·93	− ·52	+1·43	+ ·81	− 2·21	−0·79	+ ·02 S	1·38	+0·01
POSITION-ANGLES—CAPE.													
V. 16	5·43	z	− ·39	− ·92	− ·64	+ ·22	+ ·52	− ·12	− ·30	−0·91	G_1	3·31	−0·05
POSITION-ANGLES—YALE.													
V. 19	6·70	z	+ ·54	+ ·84	− ·43	+ ·38	+ ·59	+ ·26	+ ·41	+0·59	E	1·13	−0·22
20	6·74	z	+ ·51	+ ·86	− ·56	+ ·38	+ ·64	+ ·28	+ ·47	+ ·73	H	0·55	− ·10
21	7·67	z	+ ·42	+ ·91	− ·48	+ ·70	+1·52	+1·17	+ 2·54	+0·40	H	0·28	− ·48
22	7·76	z	+ ·41	+ ·91	− ·67	+ ·72	+1·60	+1·27	+ 2·82	+1·04	E	1·63	+ ·16
POSITION-ANGLES—LEIPZIG.													
V. 23	7·46	z	+ ·43	+ ·91	− ·65	+ ·63	+1·33	+ ·91	+ 1·94	+1·16	P	0·59	+0·28

GROUP VI.

Epoch, July 11d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
DISTANCES—CAPE.													
VI. 1	10·39	x	+ ·72	+ ·70	+ ·80	− ·44	− ·43	+ ·27	+ ·26	+0·56	+1·23 A_2	5·88	+0·01
2	11·66	x w	− ·43	+ ·90	+ ·81	− ·29	+ ·60	− ·19	+ ·40	+ ·87	+ ·01 A_3	6·62	·00

VI. 1. For first set of 4 observations I 2, S 2; the second set I 3, but an additional half set was measured. The 6 observations of second set were combined with equal weight with the 4 observations of the first set.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
DISTANCES—LEIPZIG.													
VI. 3	9·57	x y	+ ·92	+ ·37	− ·48	−1·31	− ·53	+1·88	+ ·76	+0·36	+ ·27 P	2·16	−0·03
4	11·43	w x	− ·38	+ ·91	− ·92	− ·16	+ ·40	− ·07	+ ·17	+ ·80	+ ·32 P	1·18	− ·08

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GROUP VI.—*continued.*

Epoch, July 11d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O-C.		p	r
DISTANCES—YALE.													
VI. 6	July 12·77	w	− ·50	− ·86	+ ·69	− ·88	−1·52	−1·56	− 2·69	−1″·02	+1·41 E_1	1·07	+0″·29
DISTANCES—GÖTTINGEN.													
VI. 7	9·61	x y	+ ·92	+ ·38	− ·61	−1·29	− ·53	+1·80	+ ·74	+0·13	+ ·30 S	0·70	−0·14
8	10·58	x	+ ·59	+ ·81	− ·82	− ·25	− ·34	+ ·11	+ ·14	− ·01	+1·35 S	0·69	− ·27
9	11·50	w x	− ·39	+ ·91	− ·83	− ·20	+ ·45	− ·10	·00	+ ·67	+ ·23 S	1·38	− ·11
POSITION-ANGLES—CAPE.													
VI. 10	10·69	x	+ ·88	− ·48	− ·96	− ·27	+ ·15	+ ·09	− ·05	−0·67	G	1·47	−0·22
POSITION-ANGLES—YALE.													
VI. 12	12·69	w	− ·91	+ ·42	− ·63	−1·54	+ ·71	−2·60	+ 1·20	+0·97	H	0·47	+0·51
13	12·77	w	− ·86	+ ·51	− ·34	−1·52	+ ·90	−2·69	+ 1·60	+ ·76	E	1·63	+ ·21
POSITION-ANGLES—LEIPZIG.													
VI. 14	9·45	x y	+ ·37	− ·91	+ ·91	− ·17	+1·41	+ ·89	− 2·20	−0·87	P	2·98	−0·02
POSITION-ANGLES—GÖTTINGEN.													
VI. 15	9·45	x y	+ ·37	− ·91	+ ·91	− ·57	+1·41	+ ·88	− 2·19	−0·70	S	1·30	+0·15
16	10·45	x	+ ·73	− ·68	+ ·82	− ·40	+ ·37	+ ·21	− ·20	− ·48	S	0·65	+ ·16
POSITION-ANGLES—BAMBERG.													
VI. 17	11·54	w x	+ ·90	+ ·43	− ·51	+ ·50	+ ·24	+ ·29	+ ·13	+0·25	H_g	0·60	−0·15

GROUP VII.

Epoch, July 18·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O-C.		p	r
DISTANCES—CAPE.													
VII. 2	17·40	t	+ ·53	− ·85	− ·21	− ·32	+ ·51	+ ·19	− ·31	−0·79	0·00 G_1	2·74	+0·12
4	18·34	t	−1·00	+ ·02	− ·66	− ·34	+ ·01	− ·12	·00	+ ·11	+1·56 A_2	2·61	+ ·04
5	18·65	t	−1·00	+ ·06	+ ·81	− ·65	+ ·04	− ·42	+ ·02	+ ·10	+1·12 G_1	2·74	− ·04
6	19·33	t q	−1·00	+ ·01	− ·69	−1·33	+ ·01	−1·77	+ ·02	+ ·19	+ ·19 G_1	5·48	− ·01
7	19·66	t q	−1·00	− ·02	+ ·79	−1·65	− ·03	−2·74	− ·05	+ ·36	· ·00 A_2	3·32	+ ·16

VII. 2. With correction for ψ (see Triangulation Chap. X.). The separate values of ψ are given in the original observations. The mean correction applied is + 0″·269.
VII. 4. Two first observations I. 4 ; two next I. 2-3 ; in combining them double weight is given to latter.

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GROUP VII.—*continued.*

Epoch, July 18d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
						DISTANCES—YALE.							
VII. 8	July 15·66	v	— ·62	+ ·78	— ·84	+1·45	—1·82	—3·40	+ 4·27	+0·27	+2·27 H_2	1·12	—0·18
9	15·75	v	— ·70	+ ·71	— ·51	+1·58	—1·61	—3·54	+ 3·62	+ ·08	+1·96 E_2	1·07	— ·09
14	18·66	t	—1·00	+ ·04	— ·39	— ·66	+ ·02	— ·44	+ ·02	— ·07	+1·12 E_1	1·38	+ ·12
15	18·80	t	—1·00	+ ·05	+ ·27	— ·80	+ ·04	— ·64	+ ·03	+ ·18	+1·00 H	0·73	+ ·27
						DISTANCES—BAMBERG.							
VII. 17	18·54	t	—1·00	+ ·03	+ ·27	— ·54	+ ·02	— ·29	+ ·01	+0·07	+1·21 H_g	0·39	—0·17

VII. 10 and 11. Victoria and the comparison stars were observed as a double star. Observations useless.

						POSITION-ANGLES—CAPE.							
VII. 19	17·36	t	— ·74	— ·67	— ·82	+ ·47	+ ·43	— ·30	— ·27	—0·26	G_1	3·70	+0·23
20	17·64	t	— ·52	+ ·85	+ ·84	+ ·10	— ·31	— ·07	+ ·11	+ ·90	A	3·70	— ·01
21	18·36	t	+ ·02	+1·00	+ ·55	+ ·01	+ ·36	·00	+ ·13	+ ·89	A_3	2·61	— ·05
22	18·64	t	+ ·06	+1·00	+ ·51	+ ·04	+ ·64	+ ·02	+ ·41	+ ·86	G_1	1·92	— ·07
23	19·37	t q	+ ·01	+1·00	+ ·53	+ ·01	+1·37	+ ·02	+ 1·88	+ ·78	G_1	3·84	— ·15
24	19·63	t q	— ·02	+1·00	+ ·56	— ·03	+1·62	— ·04	+ 2·65	+ ·68	A_3	3·84	— ·25
						POSITION-ANGLES—YALE.							
VII. 25	15·66	v	+ ·78	+ ·62	— ·15	—1·82	—1·45	+4·27	+ 3·40	—0·41	H	0·37	—0·89
26	15·76	v	+ ·72	+ ·70	— ·57	—1·61	—1·57	+3·61	+ 3·51	+ ·23	E	1·63	— ·32
27	17·66	t	— ·55	+ ·83	— ·83	+ ·19	— ·28	— ·07	+ ·10	+ ·94	H	0·55	+ ·04
28	17·78	t	— ·29	+ ·96	— ·66	+ ·06	— ·21	— ·01	+ ·05	+ ·85	E	2·09	— ·11
29	18·66	t	+ ·04	+1·00	— ·74	+ ·03	+ ·66	+ ·02	+ ·44	+1·19	E	2·09	+ ·26
30	18·80	t	+ ·05	+1·00	— ·77	+ ·04	+ ·80	+ ·03	+ ·64	+ ·60	H	0·89	— ·32
						POSITION-ANGLES—BAMBERG.							
VII. 31	18·58	t	+ ·03	+1·00	— ·87	+ ·02	+ ·58	+ ·01	+ ·34	+0·97	H_g	0·59	+0·04

GROUP VIII.

Epoch. July 21d·5.

						DISTANCES—CAPE.							
VIII. 1	20·34	q	+ ·07	+ ·24	+ ·78	—1·12	— ·28	+1·31	+ ·32	—0·05	+0·85 A_2	5·20	+0·05
2	20·65	q	+ ·94	+ ·33	— ·56	— ·80	— ·28	+ ·68	+ ·24	— ·14	+1·05 G_2	2·74	— ·13
3	21·31	q	+ ·76	+ ·65	+ ·93	— ·14	— ·12	+ ·03	+ ·03	+ ·22	+1·82 G_1	4·49	— ·03
4	21·65	q	+ ·37	+ ·93	+ ·22	+ ·05	+ ·14	+ ·01	+ ·02	+ ·41	A_2	2·61	— ·36
5	22·35	q	— ·63	+ ·77	+ ·04	— ·53	+ ·65	— ·45	+ ·55	+ ·59	+1·79 A_1	2·61	— ·06

VIII. 4. Auwers notes, "Eye of observer very tired and painful during observation of distances, stars appearing to tired eye rather faint, it was necessary, in measures of distance, to move through rather large arcs in position-angle. Found the total rotation to have been between 2° 40′ and 3° 20′." This is assumed to mean that $\psi = 1^\circ\ 30'$, corresponding correction applied + ″·145.

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GROUP VIII.—*continued.*

Epoch, July 21d·5.

DISTANCES—YALE.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
	July									″			″
VIII. 7	20·67	q	+ ·95	+ ·32	+ ·03	− ·79	− ·27	+ ·65	+ ·22	+0·15	+1·06 E	0·57	+0·49
8	21·65	q	+ ·41	+ ·91	− ·54	+ ·06	+ ·14	+ ·01	+ ·02	+ ·22	+2·44 H_2	1·12	− ·08
9	21·79	q	+ ·14	+ ·99	− ·79	+ ·04	+ ·29	+ ·01	+ ·08	+ ·04	+2·56 E_2	1·38	− ·06
10	22·65	q	− ·80	+ ·60	− ·74	− ·92	+ ·69	−1·06	+ ·79	− ·01	+1·39 E_2	1·38	− ·21

DISTANCES—BAMBERG.

VIII. 11	20·60	q	+ ·95	+ ·30	− ·63	− ·86	− ·27	+ ·77	+ ·24	+0·13	+1·01 H_g	0·39	+0·06
12	22·54	q	− ·76	+ ·65	− ·73	− ·79	+ ·68	− ·82	+ ·70	+ ·55	+1·52 H_g	0·20	− ·19

POSITION-ANGLES—CAPE.

VIII. 13	20·39	q	+ ·25	− ·97	− ·40	− ·28	+1·08	+ ·31	− 1·19	−0·75	A_2	5·20	+0·20
14	20·61	q	+ ·32	− ·95	− ·72	− ·28	+ ·84	+ ·25	− ·75	− ·98	G_2	3·31	− ·04
15	21·36	q	+ ·69	− ·72	+ ·02	− ·10	+ ·10	+ ·01	− ·01	− ·55	G_1	3·31	+ ·25
16	21·62	q	+ ·90	− ·42	− ·86	+ ·11	− ·05	+ ·01	·00	− ·47	A_2	4·30	+ ·10
17a	22·32	q	+ ·80	+ ·60	+ ·90	+ ·66	+ ·49	+ ·54	+ ·40	+ ·44	A_2	3·54	+ ·05
17b	22·61	q	+ ·63	+ ·78	·00	+ ·70	+ ·87	+ ·77	+ ·96	+ ·55	G_2	1·47	− ·04

VIII. 17. The observation 404 is suspected 10′ in error in Position-Angle. It is considered safest to reject this, and the corresponding observation 405, made in reverse position of the prism. Thus only 6 of the 8 observations are employed.

POSITION-ANGLES—YALE.

VIII. 18	20·67	q	+ ·32	− ·95	+ ·81	− ·26	+ ·79	+ ·22	− ·65	−1·24	E	1·63	−0·30
19	21·65	q	+ ·91	− ·40	+ ·64	+ ·14	− ·06	+ ·02	− ·01	−0·66	H	0·72	− ·10
20	21·79	q	+ ·99	− ·13	− ·23	+ ·29	− ·04	+ ·08	− ·01	− ·50	E	1·13	− ·18
21	22·65	q	+ ·60	+ ·80	− ·38	+ ·69	+ ·92	+ ·79	+ 1·06	+ ·67	E	1·13	+ ·06

POSITION-ANGLES—LEIPZIG.

VIII. 22	21·43	q	+ ·73	− ·68	+ ·78	− ·05	+ ·05	·00	·00	−0·79	P	1·83	−0·01

POSITION-ANGLES—BAMBERG.

VIII. 23	20·59	q	+ ·30	− ·96	+ ·70	− ·27	+ ·87	+ ·25	− ·80	−0·55	H_g	0·59	+0·40
24	22·60	q	+ ·62	+ ·78	− ·92	+ ·68	+ ·86	+ ·75	+ ·94	+ ·36	H_g	0·59	− ·23

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GROUP IX.

Epoch, July 24^{d}·0.

DISTANCES—CAPE.

Set.	t	Stars.	x'	y'	z	a	b	a'	b'	O–C.	p	v
	July									″		″
IX. 1	23·33	r n	− ·68	− ·73	− ·83	+ ·46	+ ·49	− ·31	− ·33	−0·54 + ·08 G_1	5·48	0·00
2	23·62	p q	− ·95	+ ·29	+ ·86	+ ·36	− ·11	− ·13	+ ·04	+ ·42 + ·18 A_2	6·62	·00
3	24·34	r n	− ·68	− ·71	− ·80	− ·23	− ·24	− ·08	− ·08	− ·46 + ·02 A_2	4·08	+ ·06
4	24·63	p q	− ·96	+ ·29	+ ·90	− ·60	+ ·18	− ·38	+ ·11	+ ·26 − ·40 G_3	2·12	− ·19

IX. 4. First 2 observations I. 3, next I. 4, last mere guesses.

DISTANCES—LEIPZIG.

IX. 5	24·40	p q	− ·96	+ ·27	− ·56	− ·38	+ ·11	− ·15	+ ·04	+0·63 − ·24 P	1·18	+0·23

DISTANCES—YALE.

IX. 6	23·65	p q	− ·96	+ ·28	− ·53	+ ·33	− ·10	− ·11	+ ·03	+0·57 + ·18 H_2	0·90	+0·17
7	23·80	r n	− ·69	− ·72	+ ·81	+ ·14	+ ·14	− ·03	− ·03	− ·55 + ·05 E_2	1·50	− ·01
8	24·64	p q	− ·96	+ ·29	− ·57	− ·61	+ ·18	− ·39	+ ·12	+ ·49 − ·39 E_2	1·50	− ·04
9	24·81	r n	− ·67	− ·72	+ ·84	− ·55	− ·58	− ·44	− ·48	− ·52 ·00 H_2	0·90	+ ·01

POSITION-ANGLES—CAPE.

IX. 10	23·39	r n	− ·73	+ ·68	+ ·08	+ ·44	− ·42	− ·27	+ ·25	+0·62 G_1	2·24	−0·13
11	23·61	p q	− ·29	− ·95	− ·32	+ ·11	+ ·37	− ·04	− ·14	− ·84 A_2	6·62	− ·03
12	24·60	p q	− ·29	− ·96	− ·33	− ·18	− ·57	− ·10	− ·34	− ·85 G_1	3·84	− ·04

POSITION-ANGLES—YALE.

IX. 13	23·65	p q	− ·28	− ·96	+ ·62	+ ·10	+ ·33	− ·03	− ·11	−0·81 H	0·56	0·00

POSITION-ANGLES—LEIPZIG.

IX. 14	24·41	p q	− ·27	− ·96	+ ·76	− ·11	− ·39	− ·04	− ·16	−1·07 P	1·18	−0·26

GROUP X.

Epoch, July 26^{d}·0.

DISTANCES—CAPE.

X. 1	25·36	p	+ ·86	− ·51	+ ·18	− ·55	+ ·33	+ ·35	− ·21	−0·61 +1·49 G_2	2·74	+0·12
2	25·59	p	+ ·76	− ·64	− ·83	− ·31	+ ·26	+ ·13	− ·11	−0·81 +1·89 A_3	4·30	+ ·05
3	26·31	p	− ·25	− ·97	− ·69	− ·08	− ·30	− ·03	− ·10	−1·05 +2·86 A_3	3·54	+ ·05
4	26·58	p	− ·64	− ·77	− ·02	− ·37	− ·45	− ·22	− ·26	−0·85 +2·22 G_3	1·95	− ·02
5	27·30	p	− ·91	− ·42	− ·87	−1·18	− ·55	−1·54	− ·71	− ·63 +1·90 G_1	2·74	− ·16
6	27·60	p	− ·94	− ·34	+ ·46	−1·50	− ·54	−2·41	− ·87	− ·31 + ·96 A_3	3·31	+ ·02

X. 2. The standard stars were not observed. Mean value of $\Delta\sigma = -0''\cdot016$ by Auwers adopted.

X. 5. The coefficient of G should be 1·19 *not* 1·90 as above. The error was not detected until these equations had been solved. The correction is made in the equations from Ephemeris II.

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GROUP X.—*continued.*

Epoch, July 26d·0.

DISTANCES—YALE.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
	July									″			″
X. 7	25·64	p	+ ·73	− ·68	+ ·77	− ·26	+ ·24	+ ·09	− ·09	−0·91	+1·92 H_2	1·35	+0·17
8	25·77	p	+ ·62	− ·79	+ ·41	− ·14	+ ·18	+ ·03	− ·04	−1·69	+2·22 E_2	1·07	− ·21

POSITION-ANGLES—CAPE.

X. 9	25·31	p	− ·49	− ·87	− ·82	+ ·34	+ ·60	− ·23	− ·42	−0·73	G_1	4·30	−0·03
10	25·59	p	− ·64	− ·76	·00	+ ·26	+ ·31	− ·11	− ·13	− ·59	A_2	2·61	− ·01
11	26·29	p	− ·98	+ ·20	− ·64	− ·28	+ ·06	− ·08	+ ·02	+ ·37	A_1	2·61	+ ·07
12	27·34	p	− ·41	+ ·91	+ ·25	− ·55	+1·22	− ·74	+ 1·64	+ ·83	G_1	3·31	− ·02
13	27·56	p	− ·35	+ ·94	+ ·68	− ·55	+1·47	− ·85	+ 2·28	+ ·66	A_2	3·31	− ·21

POSITION-ANGLES—YALE.

X. 15	25·77	p	− ·79	− ·62	+ ·70	+ ·18	+ ·14	− ·04	− ·03	−0·42	E	1·63	+0·02

GROUP XI.

Epoch, Aug. 1d·0.

DISTANCES—CAPE.

XI. 1	28·30	p m	− ·95	− ·30	− ·84	+3·53	+1·12	−13·07	−4·14	−0·24	+ ·25 A_1	6·62	−0·03
2	28·61	p m	− ·94	− ·32	+ ·52	+3·20	+1·10	−10·82	−3·73	− ·11	− ·12 G_2	2·12	+ ·09
3	29·30	o m	− ·77	− ·62	− ·85	+2·07	+1·67	− 5·58	−4·51	− ·62	− ·01 G_2	5·48	− ·12
4	31·56	m	+ ·15	+ ·99	+ ·43	− ·07	− ·43	+ ·03	+ ·19	+ ·77	+1·45 A_2	2·61	+ ·05
	Aug.												
5	1·31	k m	− ·56	+ ·82	+ ·09	− ·17	+ ·26	− ·06	+ ·08	+ ·88	+ ·27 A_1	3·84	+ ·16
6	1·57	k m	− ·59	+ ·81	+ ·80	− ·34	+ ·46	− ·19	+ ·26	+0·93	+ ·02 G_1	5·48	+ ·19
7	2·35	k i	− ·08	−1·00	− ·54	− ·12	−1·35	− ·16	−1·81	−1·03	+ ·35 G_1	3·10	− ·11

XI 3. First set I. 3, and faint by haze; second set I. 2–3 and brighter.
XI. 5 and 6. By far the finest definition experienced till now in the observation of Victoria.

DISTANCES—LEIPZIG.

	July												
XI. 8	29·41	n l	− ·35	+ ·93	− ·88	+ ·92	−2·40	−2·37	+ 6·21	+0·94	·00 P	2·16	+0·09
9	30·54	o m	− ·73	− ·67	+ ·80	+1·07	+ ·99	−1·56	− 1·43	−0·89	− ·54 P	3·66	− ·34
10	31·44	m	+ ·27	+ ·96	− ·79	− ·15	− ·54	+ ·08	+ ·30	+1·04	+1·41 P	1·49	+ ·16
	Aug.												
11	1·38	m	− ·57	+ ·81	− ·86	− ·22	+ ·31	− ·08	+ ·12	+0·74	+ ·22 P	2·16	·00

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GROUP XI.—*continued.*

Epoch, Aug. 1d·0.

Set.	t	Stars.	x'	y'	z	a	b	a'	b'	O-C.		p	v
										″			″
	Aug.												
XI. 12	2·70	k i	— ·12	— ·98	+ ·73	— ·21	—1·66	— ·36	— 2·83	—1·32	+ ·14 E_2	1·50	—0·41
13	3·73	h i	— ·59	+ ·81	— ·47	—1·60	+2·22	—4·36	+ 6·07	+0·83	+ ·97 E_2	0·78	+ ·35
14	3·77	h i	— ·59	+ ·81	— ·36	—1·62	+2·26	—4·49	+ 6·25	+ ·64	+ ·04 H_2	·62	— ·10

XI. 13. The coefficient of E_2 in this equation should be + 0·06 E *not* 0·97 E. The equations had been solved before the error was detected. It is corrected in the solution with Ephemeris II.

Distances—Göttingen.

	July												
XI. 15	31·47	m	+ ·20	+ ·97	— ·86	— ·11	— ·51	+ ·06	+ ·27	+0·33	+1·45 S	0·69	+0·06
	Aug.												
16	1·41	k m	— ·58	+ ·81	— ·81	— ·23	+ ·33	— ·09	+ ·14	+ ·61	+ ·19 S	1·38	— ·05

Distances—Bamberg.

	July												
XI. 17	31·57	m	+ ·15	+ ·99	— ·88	— ·06	— ·42	+ ·03	+ ·18	+1·08	+1·47 H_5	0·39	+0·21

Position-Angles—Cape.

XI. 18	28·33	p m	— ·30	+ ·95	+ ·32	+1·09	—3·50	—4·00	+12·86	+0·94	A_1	6·62	+0·07
19	28·58	p m	— ·30	+ ·95	+ ·70	+1·04	—3·25	—3·56	+11·09	+ ·65	G_3	2·68	— ·21
20	31·56	m	+ ·99	— ·15	— ·68	— ·43	+ ·07	+ ·19	— ·03	— ·30	A_2	2·61	— ·12
	Aug.												
21	1·29	k m	— ·82	— ·55	— ·86	— ·24	— ·16	— ·07	— ·04	— ·36	A_1	6·62	+ ·09
22	1·53	k m	— ·81	— ·59	+ ·10	— ·43	— ·31	— ·22	— ·17	— ·39	G_1	3·84	+ ·09
23	2·33	k i	— ·99	+ ·08	— ·47	—1·32	+ ·10	—1·75	+ ·14	+ ·23	G_1	3·84	+ ·11

Position-Angles—Yale.

XI. 24	2·70	k i	— ·98	+ ·13	— ·03	—1·66	+ ·21	—2·83	·00	—0·41	E	1·18	—0·57
25	3·73	h i	— ·81	— ·59	+ ·60	—2·22	—1·60	—6·07	— 4·36	— ·70	E	1·18	— ·22
25a	3·77	h i	— ·81	— ·59	+ ·76	—2·26	—1·62	—6·25	— 4·49	— ·23	H	0·38	+ ·24

Position-Angles—Leipzig.

	July												
XI. 26	31·39	m	+ ·95	— ·31	+ ·52	— ·58	+ ·19	+ ·35	— ·11	—0·29	P	1·08	+0·03
27	31·53	m	+ ·98	— ·19	— ·11	— ·46	+ ·09	+ ·21	— ·04	— ·55	P	0·59	— ·34
	Aug.												
28	1·52	k m	— ·81	— ·59	+ ·72	— ·42	— ·31	— ·21	— ·16	— ·39	P	2·16	+ ·09

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GROUP XI.—*continued.*

Epoch, Aug. 1d·0. POSITION-ANGLES—GÖTTINGEN.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O-C.		p	r
	July									″			″
XI. 29	31·47	m	+ ·97	− ·24	+ ·20	− ·51	+ ·13	+ ·27	− ·07	−0·05	S	0·65	+0·21
						POSITION-ANGLES—BAMBERG.							
XI. 30	31·57	m	+ ·99	− ·15	− ·29	− ·42	+ ·06	+ ·18	− ·03	−0·34	H_g	0·59	−0·16
	Aug.												
31	1·52	k m	− ·81	− ·59	− ·71	− ·42	− ·31	− ·21	− ·16	− ·41	H_g	1·18	+ ·07

XI. 31. In the first solution the co-efficient of z was erroneously used as −0·71 instead of +0·71. The error was detected in the independent formation of the equations for the solution from Ephemeris II., but it was not considered necessary to carry this correction through the preliminary discussion, as its effect on the final result would be insensible. The corrected equation is, of course, employed in the final solution.

GROUP XII.

Epoch, Aug. 7d·0. DISTANCES—CAPE.

	Aug.												
XII. 1	5·35	g	+ ·62	− ·78	− ·14	−1·02	+1·29	+1·69	− 2·12	−1·02	+1·39A_2	3·54	−0·12
2	6·28	f	+ ·90	+ ·44	+ ·81	− ·65	− ·32	+ ·47	+ ·23	+0·12	+1·27G_1	4·49	− ·02
3	6·58	f	+ ·88	+ ·48	− ·30	− ·37	− ·20	+ ·16	+ ·09	·00	+1·56A_2	4·30	− ·14
4	7·26	f	+ ·81	+ ·59	+ ·87	+ ·21	+ ·15	+ ·06	+ ·04	+ ·16	+1·47A_2	4·30	− ·08
5	7·54	f	+ ·67	+ ·74	− ·01	+ ·36	+ ·40	+ ·19	+ ·21	+ ·37	G_1	2·74	− ·16
6	8·28	f	− ·97	+ ·24	− ·51	−1·24	+ ·31	−1·59	+ ·39	+ ·71	G_2	1·55	+ ·31
7	8·61	f	−1·00	− ·06	+ ·75	−1·61	− ·10	−2·59	− ·15	+ ·41	A_2	3·70	+ ·25

XII. 4. Auwers remarks as follows:—"I. 2-3 and 2 rather faint at beginning. Observations difficult and not very accurate owing to the small distance, necessitating a total rotation in Position-Angle = 3° 45′. The field being only feebly illuminated by the Moon the motions were generally made tangential in observations 659 and 660; but in 661 and 662, with better images, I endeavoured to observe the bisections themselves, while in 663–666 I purposely disregarded the wires."

The corrections corresponding to $\psi = 1° 55'$, viz. + 0″·193 are applied to 659 and 660; no corrections are applied to 661 and 662, whilst for the observations 663-666 the correction is left in the symbolic form.

XII. 5. Observations of cos. s instead of s were made. For values of ψ see original observations. Mean correction is + 0″·151, which is applied.

XII. 6. $\psi = 3° 7'$, corresponding correction + 0″·231 applied.

XII. 7. ψ was measured for each observation (see original observations). The mean correction is + 0″·096.

						DISTANCES—YALE.							
XII. 10	5·62	g	+ ·45	− ·89	+ ·77	− ·62	+1·23	+ ·85	− 1·69	−1·19	+1·45E_2	1·38	+0·15
13	8·71	f	− ·99	− ·14	+ ·29	−1·60	− ·24	−2·89	− ·41	−0·16	+2·94E_2	·39	+ ·62
						DISTANCES—GÖTTINGEN.							
XII. 14	5·45	g	+ ·55	− ·83	+ ·71	− ·85	+1·29	+1·32	− 1·99	−1·45	+1·41S	0·69	−0·11
15	6·54	f	+ ·89	+ ·45	− ·69	− ·41	− ·21	+ ·19	+ ·09	−0·30	+1·52S	·35	+ ·03

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GROUP XII.—*continued.*

Epoch, Aug. $7^d \cdot 0$.

POSITION-ANGLES—CAPE.

Set.	t	Stars.	x'	y'	z	a	b	a'	b'	O-C.		p	r
	Aug.									°			°
XII. 16	5·27	g	− ·75	− ·66	− ·86	+1·29	+1·14	−2·23	− 1·97	−0·41	A_1	4·30	+0·10
17	6·32	f	+ ·45	− ·90	− ·24	− ·30	+ ·61	+ ·20	− ·40	− ·89	G_1	3·31	− ·05
18	6·53	f	+ ·47	− ·88	− ·71	− ·22	+ ·41	+ ·10	− ·19	−0·99	A_1	4·30	− ·16
19	7·30	f	+ ·61	− ·79	− ·05	+ ·18	− ·24	+ ·05	− ·07	−1·05	A_1	2·19	− ·26
20	7·58	f	+ ·78	− ·63	− ·88	+ ·45	− ·36	+ ·26	− ·21	−0·65	G_1	3·70	+ ·03
21	8·30	f	+ ·20	+ ·98	+ ·60	+ ·26	+1·27	+ ·34	+ 1·66	+ ·82	G_1	3·70	+ ·02
22	8·55	f	− ·03	+1·00	+ ·53	− ·05	+1·55	− ·07	+ 2·40	+ ·83	A_2	3·70	− ·03
23	9·31	f	− ·24	+ ·97	+ ·36	− ·55	+2·24	−1·28	+ 5·18	+ ·98	A_2	4·30	+ ·10
						POSITION-ANGLES—YALE.							
XII. 24	5·62	g	− ·89	− ·45	+ ·10	+1·23	+ ·62	−1·69	− ·85	−0·62	E	1·13	−0·31
25	7·59	f	+ ·73	− ·68	+ ·75	+ ·43	− ·40	+ ·25	− ·24	− ·75	E	1·63	− ·03
26	7·74	f	+ ·89	− ·44	+ ·02	+ ·66	− ·32	+ ·49	− ·24	− ·63	E	·87	− ·09
27	8·71	f	− ·14	+ ·99	− ·69	− ·24	+1·69	− ·41	+ 2·89	+ ·77	E	1·13	− ·10
						POSITION-ANGLES—GÖTTINGEN.							
XII. 29	5·45	g	− ·83	− ·55	+ ·47	+1·29	+ ·85	−1·99	− 1·32	−0·20	S	0·65	+0·20
						POSITION-ANGLES—BAMBERG.							
XII. 31	4·53	g i	+ ·53	+ ·85	− ·88	−1·30	−2·09	+3·21	+ 5·15	+0·86	H_g	1·18	+0·15

GROUP XIII.

Epoch, Aug. $13^d \cdot 0$.

DISTANCES—CAPE.

XIII. 1	10·28	f e	− ·85	− ·48	− ·75	+2·32	+1·30	− 6·30	−3·53	−0·22	+ ·35 G_2	5·48	−0·02
2	10·55	f e	− ·83	− ·51	+ ·27	+2·03	+1·24	− 4·97	−3·05	− ·13	+ ·19 A_2	3·84	+ ·08
3	11·26	f e	− ·78	− ·58	− ·81	+1·35	+1·01	− 2·36	−1·77	− ·32	− ·16 A_2	6·62	− ·10
4	12·28	e	+ ·53	+ ·85	+ ·72	− ·38	− ·61	+ ·27	+ ·44	+ ·52	+1·33 G_3	3·36	− ·16
5	14·35	e	− ·56	+ ·83	+ ·26	− ·76	+1·12	− 1·02	+1·51	+ ·86	G_1	2·74	+ ·03
6	16·29	e	− ·91	− ·41	− ·61	−3·00	−1·35	− 9·90	−4·45	− ·01	+1·79 G_2	2·74	+ ·12
7	16·56	e	− ·89	− ·46	+ ·39	−3·17	−1·64	−11·27	−5·83	− ·09	+1·59 A_3	2·61	+ ·06

XIII. 5. The observations 787, 788 were made in the usual manner, but in observations 791 and 792 the images were placed parallel to the wires and the position-angles read to permit reduction.
Observations 791 and 792 require each a correction of $+0''\cdot04$, *i.e.*, a correction of $+0''\cdot02$ to the means of 4 observations; the others seem to be true bisections.

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GROUP XIII.—*continued.*

Epoch, Aug. 13d·0.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	τ
						DISTANCES—LEIPZIG.							
	Aug.									″			″
XIII. 8	10·48	e	+ ·70	+ ·71	− ·73	−1·76	−1·79	+ 4·44	+4·51	+0·66 + ·74	P	·59	+0·16
9	11·48	f e	− ·75	− ·62	+ ·68	+1·14	+ ·94	− 1·73	−1·43	− ·43 − ·30	P	2·16	− ·16
10	12·49	e	+ ·50	+ ·87	− ·85	− ·25	− ·44	+ ·13	+ ·23	+ ·55 +1·49	P	2·14	− ·01
11	16·49	e	− ·88	− 47	+ 65	−3·07	−1·64	−10·72	−5·72	+ ·08 +1·61	P	2·14	+ ·05
						DISTANCES—YALE.							
XIII. 12	10·63	f e	− ·83	− ·52	+ ·24	+1·96	+1·23	− 4·65	−2·92	−0·30 + ·15	E	·78	−0·06
13	11·59	f e	− ·74	− ·62	+ ·22	+1·04	+ ·88	− 1·47	−1·24	− ·37 − ·35	E_2	·78	− ·20
14	16·57	e	− ·87	− ·48	+ ·06	−3·10	−1·73	−11·08	−6·18	− ·55 +1·57	E_2	·39	− ·01
15	16·72	e	− ·86	− ·51	+ ·05	−3·20	−1·90	−11·90	−7·06	− ·09 +1·47	E_2	·75	+ ·45
						DISTANCES—GÖTTINGEN.							
XIII. 17	11·48	f	− ·92	− ·39	+ ·49	+1·40	+ ·59	− 2·12	− ·90	−0·30 + ·70	S	·35	−0·10
18	16·53	e	− ·88	− ·47	+ ·73	−3·11	−1·66	−10·96	−5·85	− ·64 +1·59	S	·69	·00
						POSITION-ANGLES—CAPE.							
XIII. 19	10·32	f e	− ·48	+ ·85	+ ·21	+1·29	−2·27	− 3·45	+ 6·08	+0·93	G_2	1·92	+0·09
20	10·52	f e	− ·51	+ ·83	+ ·69	+1·25	−2·06	− 3·12	+ 5·10	+ ·83	A_1	6·62	·00
21	11·29	f e	− ·59	+ ·77	+ ·05	+1·01	−1·31	− 1·72	+ 2·25	+ ·81	A_2	3·84	·00
22	11·53	f e	− ·62	+ ·74	+ ·76	+ ·91	−1·08	− 1·33	+ 1·59	+ ·69	G_2	1·66	− ·10
23	14·34	e	+ ·83	+ ·55	+ ·48	+1·11	+ ·74	+ 1·49	+ ·99	+ ·33	G_1	2·61	+ ·22
24	16·35	e	− ·42	+ ·91	+ ·34	−1·41	+3·05	− 4·71	+10·21	+1·04	G_2	1·30	+ ·23
25	16·50	e	− ·45	+ ·89	+ ·66	−1·57	+3·11	− 5·51	+10·90	+ ·70	A_2	4·30	− ·11
						POSITION-ANGLES—YALE.							
XIII. 26	10·63	f e	− ·52	+ ·83	− ·68	+1·23	−1·97	− 2·91	+ 4·67	+0·93	E	2·26	+0·09
27	11·59	f e	− ·62	+ ·74	− ·73	+ ·88	−1·04	− 1·24	+ 1·47	+ ·81	E	2·26	+ ·01
28	16·57	e	− ·48	+ ·87	− ·76	−1·71	+3·12	− 6·10	+11·14	+ ·80	E	1·13	− ·01
29	16·72	e	− ·51	+ ·86	− ·42	−1·90	+3·20	− 7·06	+11·90	+ ·43	E	1·13	− ·38
						POSITION-ANGLES—LEIPZIG.							
XIII. 30	10·37	f e	− ·49	+ ·84	− ·80	+1·28	−2·22	− 3·37	+ 5·82	−0·85	P	1·18	+0·01
31	12·36	e	+ ·85	− ·53	+ ·63	− ·54	+ ·34	+ ·35	− ·22	− ·48	P	1·08	+ ·23

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GROUP XIII.—*continued.*

Epoch, Aug. 13d·0. POSITION-ANGLES—GÖTTINGEN.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
	Aug.									°			°
XIII. 32	10·42	f e	— ·50	+ ·84	— ·72	+1·28	—2·17	—3·31	+ 5·61	+0·64	S	1·30	—0·19
33	16·39	e	— ·45	+ ·89	— ·77	—1·52	+3·02	—5·17	+10·23	+ ·43	S	·65	— ·38

GROUP XIV.

Epoch, Aug. 19d·0. DISTANCES—CAPE.

XIV. 2	18·30	f a	— ·85	— ·52	— ·59	+ ·60	+ ·36	— ·42	— ·25	+0·04	— ·01 G_2	5·48	+0·07
3	19·33	f a	— ·85	— ·50	— ·44	— ·28	— ·17	— ·09	— ·05	+ ·20	— ·03 A_2	5·06	+ ·22
4	19·53	c d	— ·41	+ ·90	+ ·71	— ·22	+ ·49	— ·12	+ ·26	+ ·71	+ ·33 G_2	3·90	+ ·01
5	20·51	d	— ·62	+ ·79	+ ·72	— ·94	+1·19	—1·41	+ 1·80	+ ·49	+1·05 A_2	5·20	— ·10
6	21·26	e b	— ·53	— ·84	— ·67	—1·20	—1·91	—2·72	— 4·31	— ·34	+ ·23 A_2	6·62	+ ·03

XIV_1 Rejected for discordance. Set incomplete and unsymmetrical. Pointings noted "very difficult and uncertain."

DISTANCES—LEIPZIG.

XIV. 7	17·48	f a	— ·85	— ·53	+ ·65	+1·29	+ ·80	—1·96	— 1·22	+0·17	+ ·03 P	2·16	+0·21
8	18·36	c d	— ·36	+ ·93	— ·81	+ ·23	— ·60	— ·15	+ ·38	+ ·61	+ ·12 P	2·16	— ·15
9	18·49	f a	— ·85	— ·52	+ ·67	+ ·43	+ ·26	— ·22	— ·13	+ ·15	— ·01 P	3·66	+ ·18
10	20·35	d	— ·59	+ ·80	— ·74	— ·80	+1·08	—1·07	+ 1·46	+ ·86	+1·04 P	1·08	+ ·08

DISTANCES—YALE.

XIV. 11	17·59	c d	— ·37	+ ·92	— ·72	+ ·52	—1·30	— ·73	+ 1·83	+0·68	— ·02 E_1	2·14	—0·10
12	17·71	f a	— ·85	— ·52	+ ·63	+1·09	+ ·67	—1·41	— ·86	— ·08	+ ·02 E_2	1·50	— ·04
13	18·59	c d	— ·36	+ ·93	— ·72	+ ·15	— ·38	— ·06	+ ·16	+ ·47	+ ·15 E_1	1·50	— ·24
14	21·70	e b	— ·52	— ·85	+ ·73	—1·41	—2·30	—3·81	— 6·21	— ·60	+ ·17 E_1	1·50	— ·20

DISTANCES—GÖTTINGEN.

XIV. 15	17·41	c d	— ·37	+ ·92	— ·74	+ ·59	—1·46	— ·94	+ 2·32	+0·82	— ·05 S	1·38	+0·02
17	20·51	e b	— ·56	— ·83	+ ·85	— ·84	—1·25	—1·28	— 1·90	— ·19	+ ·29 S	1·38	+ ·27

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GROUP XV.

Epoch, Aug. 24d·0.

Distances—Cape.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.			p	v
	Aug.									″				″
XV. 1	22·31	d	— ·89	+ ·45	— ·07	+1·50	— ·76	—2·54	+ 1·29	+0·44	+1·56	G_1	2·74	+0·04
2	22·51	d	— ·92	+ ·38	+ ·72	+1·37	— ·57	—2·04	+ ·84	+ ·37	+1·61	A_3	4·30	+ ·01
3	23·26	d	—1·00	+ ·08	— ·45	+ ·74	— ·06	— ·55	+ ·04	+ ·27	+1·92	A_2	2·61	+ ·11
4	23·52	d	—1·00	— ·05	+ ·60	+ ·48	+ ·02	— ·23	— ·01	— ·07	+1·96	G_2	3·25	— ·14
5	24·53	d	— ·82	— ·57	+ ·26	— ·43	— ·30	— ·23	— ·16	— ·27	+1·96	A_2	2·61	+ ·02
6	26·28	d	— ·22	— ·98	— ·51	— ·50	—2·23	—1·14	— 5·10	— ·61	+1·30	G_2	2·74	+ ·01
7	26·48	d	— ·17	— ·98	— ·35	— ·42	—2·43	—1·04	— 6·03	— ·48	+1·22	A_1	4·40	+ ·17

Distances—Yale.

XV. 8	22·71	d	— ·95	+ ·30	+ ·13	+1·22	— ·39	—1·58	+ ·50	—0·32	+1·72	E_2	·39	—0·25

Distances—Leipzig.

XV. 9	25·46	d	— ·48	— ·88	+ ·80	— ·70	—1·28	—1·02	— 1·87	—0·39	+1·61	P	1·49	—0·05

Distances—Göttingen.

XV. 10	22·50	d	— ·93	+ ·37	+ ·04	+1·39	— ·55	—2·09	+ ·83	—0·10	+1·64	S	·35	+0·05
11	25·45	d	— ·48	— ·88	+ ·78	— ·70	—1·28	—1·01	— 1·85	— ·46	+1·61	S	·35	+ ·56

Position-Angles—Cape.

XV. 12	22·27	d	+ ·47	+ ·88	+ ·63	— ·81	—1·52	+1·40	+ 2·63	+0·40		G_2	4·30	+0·02
13	22·48	d	+ ·39	+ ·92	+ ·22	— ·59	—1·40	+ ·90	+ 2·12	+ ·31		A_2	2·61	— ·12
14	23·28	d	+ ·07	+1·00	+ ·48	— ·05	— ·72	+ ·04	+ ·52	+ ·49		A_3	2·61	— ·08
15	23·47	d	— ·03	+1·00	+ ·46	+ ·02	— ·52	— ·01	+ ·28	+ ·63		G_2	2·61	+ ·03
16	24·54	d	— ·57	+ ·82	+ ·77	— ·31	+ ·44	— ·17	+ ·24	+ ·63		A_3	2·61	— ·01
17	26·30	d	— ·98	+ ·21	— ·20	—2·25	+ ·48	—5·18	+ 1·11	+ ·48		G_3	·83	+ ·10
18	26·49	d	— ·99	+ ·17	+ ·62	—2·46	+ ·42	—6·14	+ 1·05	+ ·21		A_1	5·20	— ·15

XV_{17}. The value of Δp is taken from the mean value of Δp on the same side of the meridian in the same group.

Position-Angles—Yale.

XV. 19	22·71	d	+ ·30	+ ·95	— ·75	— ·39	—1·22	+ ·50	+ 1·58	+0·71		E	1·39	+0·23

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GROUP XV.—*continued.*

Epoch, Aug. 24d·0. POSITION-ANGLES—LEIPZIG.

Set.	t	Stars.	x′	y′	z	a	b	a′	b′	O–C.		p	v
	Aug.									°			°
XV. 20	25·46	d	— ·88	+ ·48	— ·13	—1·28	+ ·70	—1·87	+ 1·02	+0·80	P	1·49	+0·29
POSITION-ANGLES—GÖTTINGEN.													
XV. 21	22·52	d	+ ·36	+ ·93	— ·86	— ·54	—1·38	+ ·80	+ 2·04	+0·09	S	·33	—0·35
22	25·49	d	— ·88	+ ·47	— ·07	—1·31	+ ·70	—1·95	+ 1·04	+ ·24	S	·65	— ·27

In order to determine the constant errors to which the Triangulation of the comparison stars shewed that Heliometer-measures of small single distances are liable, as well as to ascertain the probable form of the necessary corrections to be applied to the Tabular Right Ascensions and Declinations, normal equations from each Group were formed, including *all* the equations depending upon position-angles, and including also all the equations depending on observations of distance of *two* stars on opposite sides of the planet, but *excluding* all equations founded on single distances.

The solution of these normals furnished the following values of z in terms of a, b, a' and b', and of x' and y' in terms of z, a, b, a' and b'.

PRELIMINARY VALUES OF z (EXCLUDING SINGLE DISTANCES).

Group.	Date.	n_z					Limits.	Weight.
I.	June 11·0	$z =$ —0·108	+0·72 a	—0·47 b	+0·21 a'	—0·13 b'	June 10–12	1·2
II.	17·0	+ ·002	— ·01	+ ·17	+ ·21	— ·09	15–19	12·3
III.	22·0	+ ·180	+ ·47	+ ·01	+1·45	+1·33	19–26	12·5
IV.	29·0	+ ·073	+ ·77	—1·00	+ ·42	— ·66	26–33	29·2
V.	July 6·0	— ·034	+ ·03	+ ·75	+ ·07	—1·32	July 3–9	9·4
VI.	11·0	+ ·056	+ ·28	— ·79	— ·30	+0·60	9–12	9·4
VII.	18·0	— ·027	— ·09	— ·24	+ ·56	+ ·02	15–20	15·2
VIII.	21·5	— ·029	— ·01	+ ·03	·00	·00	20–23	11·0
IX.	24·0	— ·079	+ ·01	+ ·13	— ·04	— ·02	23–25	14·0
X.	26·0	— ·063	— ·01	— ·17	+ ·09	— ·58	25–28	4·3
XI.	Aug. 1·0	— ·019	+ ·44	+ ·45	—1·34	— ·97	28–35	30·7
XII.	7·0	— ·051	— ·07	+ ·06	+ ·04	+ ·75	Aug. 4–10	9·1
XIII.	13·0	+ ·020	·00	— ·11	+ ·09	— ·44	10–17	17·7
XIV.	19·0	— ·001	— ·11	— ·60	— ·28	— ·17	17–22	16·9
XV.	24·0	— ·145	+ ·33	+ ·11	+ ·56	— ·23	22–27	4·1

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Preliminary Values of x' (excluding single distances).

Group.	Date.	n_x						Limits.		Weight.
		″								
I.	June *	...	...	...	...	...	...		...	...
II.	17·0	$x' = -0·067$	$-0·40\,z$	$-0·81\,a$	$+0·19\,b$	$-1·40\,a'$	$+0·34\,b'$	June	15–19	8·3
III.	22·0	− ·143	− ·36	− ·98	− ·03	−3·02	− ·21		19–26	23·3
IV.	29·0	+ ·010	− ·31	− ·76	− ·16	−5·41	+ ·02		26–33	15·5
V.	July 6·0	+ ·156	− ·41	−1·56	− ·61	−4·95	+ ·77	July	3– 9	9·4
VI.	11·0	− ·058	+ ·53	+0·86	+ ·42	−1·58	− ·31		9–12	3·9
VII.	18·0	− ·280	− ·11	− ·59	+ ·29	−1·94	− ·32		15–20	13·5
VIII.	21·5	− ·155	− ·02	− ·41	− ·39	−0·37	− ·33		20–23	11·0
IX.	24·0	− ·168	+ ·16	+ ·09	− ·01	−0·25	− ·01		23–25	17·8
X.	26·0	− ·095	− ·13	− ·19	+ ·92	−0·51	+ ·78		25–28	6·5
XI.	Aug. 1·0	− ·070	− ·15	+ ·74	+ ·11	−4·29	− ·07		28–35	39·0
XII.	7·0	− ·189	− ·03	+ ·58	+ ·59	−1·64	−1·34	Aug.	4–10	10·0
XIII.	13·0	− ·210	− ·29	+1·47	+ ·47	−4·90	+ ·98		10–17	23·0
XIV.	19·0	− ·479	− ·25	+0·46	− ·12	−1·15	− ·37		17–22	15·0
XV.	24·0	− ·222	+ ·29	−1·52	+ ·97	−4·41	+ ·04		22–27	9·9

Preliminary Values of y' (excluding single distances).

Group.	Date.	n_y						Limits.		Weight.
		″								
I.	June *	...	...	...	...	...	...		...	...
II.	17·0	$y' = +0·748$	$-0·27\,z$	$+0·17\,a$	$-0·88\,b$	$+0·32\,a'$	$-1·58\,b'$	June	15–19	11·5
III.	22·0	+ ·673	+ ·17	− ·08	− ·28	− ·30	−1·41		19–26	25·0
IV.	29·0	+ ·887	− ·42	− ·22	− ·20	− ·60	−3·33		26–33	43·6
V.	July 6·0	+ ·893	− ·16	− ·10	+ ·50	+ ·57	−3·17	July	3– 9	18·9
VI.	11·0	+ ·891	+ ·30	+ ·47	+ ·26	− ·27	−1·14		9–12	8·8
VII.	18·0	+ ·822	− ·21	+ ·17	− ·54	− ·15	−1·15		15–20	22·2
VIII.	21·5	+ ·854	− ·25	− ·47	+ ·30	− ·11	−0·88		20–23	15·1
IX.	24·0	+ ·919	− ·45	− ·01	+ ·09	− ·01	−0·25		23–25	18·1
X.	26·0	+ ·823	− ·43	+ ·51	− ·56	+ ·39	−1·32		25–28	11·0
XI.	Aug. 1·0	+ ·974	− ·18	+ ·13	+ ·87	− ·14	−5·11		28–35	33·9
XII.	7·0	+ ·923	− ·43	+ ·42	− ·45	− ·44	−2·37	Aug.	4–10	23·6
XIII.	13·0	+ ·818	− ·26	+ ·50	+ ·71	+1·03	−6·45		10–17	26·8
XIV.	19·0	+ ·582	+ ·08	− ·43	− ·25	− ·74	−2·06		17–22	16·8
XV.	24·0	+ ·574	− ·42	+ ·68	+ ·82	+ ·06	−1·52		22–27	14·7

* Group I. consists only of distances of Victoria from the stars κ and μ observed at the Cape on June 10, and similar observations at Göttingen on June 11. These observations serve to determine z, but not x' and y'.

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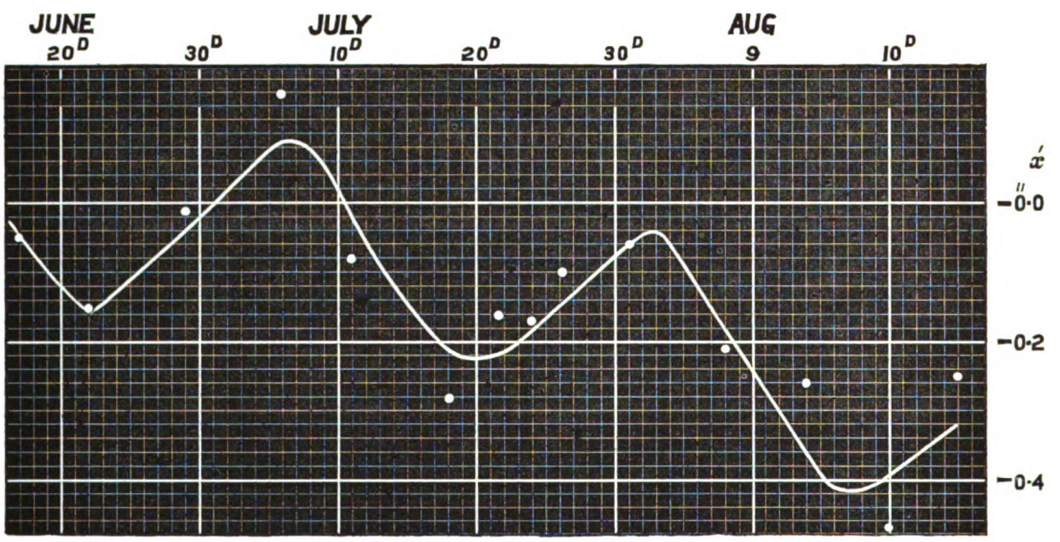
The mean value of z is obviously so small that it may for the present be neglected.

At first sight the apparent irregularities in the values x' and y', especially in the former case, seemed very disappointing; but on plotting the different values with n as the ordinate and t as the abscissa, I was delighted to find that the separate values approximated closely to a curve of about 27 days' period. The maxima and minima of this curve corresponded with the epochs when the Moon's geocentric longitude differs 90° from that of the planet, it was therefore evident that the introduction of a term depending on an error in the tabular value of the constant of the Lunar Equation would closely satisfy the observations.

This conclusion will be more obvious from inspection of the following diagram, in which the observed values of x' for each group are represented by small discs, and the curve represents the computed values of x' from the subsequent discussion contained in the present chapter.



The agreement of the observations with a term depending on the mass of the Moon can hardly be questioned.

By a preliminary computation approximate values of the small corrections depending on a, b, a' and b' were determined,* and equations of condition were formed of the type—

$$\frac{1}{\Delta}a + \frac{t}{10\Delta}\beta + \frac{t^2}{100\Delta}\gamma + f_x\,dL = x'$$

$$\frac{1}{\Delta}a' + \frac{t}{10\Delta}\beta' + \frac{t^2}{100\Delta}\gamma' + f_y\,dL = y'$$

* The adopted approximate values of a, a', b and b' are printed within brackets below the final values given in the subsequent Table of the definitive values of a, b, a' and b'. (*See* p. 417.)

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where t is the time in days reckoned from July 18·0.

Δ is the planet's distance from the Earth (the Sun's mean distance being unity).

$\alpha, \beta, \gamma, \alpha', \beta', \gamma'$ are constants to be determined.

dL is the correction of the Tabular Constant of the Lunar Equation;

and f_x and f_y the factors of the Lunar Equation determined as follows :—

$$f_x = \Delta\alpha \cos \delta = (\Delta\lambda \cos \beta \cos S - \sin S\, \Delta\beta) \frac{P_0}{P}$$

$$f_y = \Delta\delta \qquad = (\Delta\lambda \cos \beta \sin S + \cos S\, \Delta\beta) \frac{P_0}{P}$$

where

$$\Delta\lambda \cos \beta = \frac{dL}{\Delta} \sin (☾ - \lambda) \cos s$$

$$\Delta\beta = \frac{dL}{\Delta} \{\sin s \cos \beta - \cos s \sin \beta \cos (☾ - \lambda)\}$$

$$\sin S = \sin \omega \cos \alpha \sec \beta$$

and

P_0 the mean Horizontal Parallax of the Moon; P the Moon's Horizontal Parallax at Epoch.

λ and β are the geocentric longitude and latitude of the Planet.

☾ and s are the geocentric longitude and latitude of the Moon.

ω is the obliquity of the ecliptic.

α the Planet's Right Ascension.

The resulting equations are the following :—

The absolute terms of the preliminary solution are given in the column marked n_1, those of the subsequent solution in column n_2.

RIGHT ASCENSION.

Group.	Date.	t							n_1	n_2	Wt.
									″	″	
II.	June 17·0	− 31·0	1·08 α	− 3·36 β	+ 10·43 γ	+ 0·39 dL =			− 0·052	− 0·046	8·3
III.	22·0	− 26·0	1·12	− 2·91	+ 7·57	+ 1·12			− ·149	− ·149	23·4
IV.	29·0	− 19·0	1·16	− 2·20	+ 4·19	+ 0·15			− ·008	− ·001	15·5
V.	July 6·0	− 12·0	1·19	− 1·43	+ 1·71	− 1·14			+ ·166	+ ·159	9·4
VI.	11·0	− 7·0	1·20	− 0·84	+ 0·59	− 0·48			− ·080	− ·079	3·9
VII.	18·0	0·0	1·21	0·00	0·00	+ 1·16			− ·282	− ·280	13·5
VIII.	21·5	+ 3·5	1·21	+ 0·42	+ 0·15	+ 1·07			− ·157	− ·155	11·0
IX.	24·0	+ 6·0	1·20	+ 0·72	+ 0·43	+ 0·61			− ·167	− ·166	17·8
X.	26·0	+ 8·0	1·20	+ 0·96	+ 0·77	+ ·11			− ·097	− ·101	6·5

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RIGHT ASCENSION—*continued.*

Group.	Date.	t							n_1	n_2	Wt.
									″	″	
XI.	Aug. 1·0	+ 14·0	1·18	α + 1·65	β + 2·31	γ − 1·10	dL		− 0·056	− 0·058	39·0
XII.	7·0	+ 20·0	1·15	+ 2·31	+ 4·62	− 0·49			− ·208	− ·208	10·0
XIII.	13·0	+ 26·0	1·12	+ 2·91	+ 7·57	+ 0·95			− ·234	− ·261	23·0
XIV.	19·0	+ 32·0	1·08	+ 3·46	+ 11·76	+ 0·76			− ·476	− ·473	15·0
XV.	24·0	+ 37·0	1·05	+ 3·89	+ 14·38	− 0·33			− ·239	− ·250	9·9
					DECLINATION.						
II.	June 17·0	− 31·0	1·08	α_1 − 3·36	β_1 + 10·43	γ_1 − 0·19	dL =		+ 0·742	+ 0·735	11·5
III.	22·0	− 26·0	1·12	− 2·91	+ 7·57	+ ·11			+ ·669	+ ·670	25·2
IV.	29·0	− 19·0	1·16	− 2·20	+ 4·19	+ ·34			+ ·878	+ ·878	43·6
V.	July 6·0	− 12·0	1·19	− 1·43	+ 1·71	− ·06			+ ·900	+ ·901	18·9
VI.	11·0	− 7·0	1·20	− 0·84	+ 0·59	− ·33			+ ·878	+ ·879	8·8
VII.	18·0	0·0	1·21	0·00	0·00	·00			+ ·824	+ ·825	22·2
VIII.	21·5	+ 3·5	1·21	+ 0·42	+ 0·15	+ ·27			+ ·848	+ ·849	15·1
IX.	24·0	+ 6·0	1·20	+ 0·72	+ 0·43	+ ·37			+ ·917	+ ·917	18·1
X.	26·0	+ 8·0	1·20	+ 0·96	+ 0·77	+ ·39			+ ·830	+ ·834	11·0
XI.	Aug. 1·0	+ 14·0	1·18	+ 1·65	+ 2·31	+ ·06			+ ·978	+ ·974	33·9
XII.	7·0	+ 20·0	1·15	+ 2·31	+ 4·62	− ·33			+ ·918	+ ·916	23·6
XIII.	13·0	+ 26·0	1·12	+ 2·91	+ 7·57	− ·11			+ ·792	+ ·798	26·8
XIV.	19·0	+ 32·0	1·08	+ 3·46	+ 11·76	+ ·29			+ ·579	+ ·579	16·8
XV.	24·0	+ 37·0	1·05	+ 3·89	+ 14·38	+ ·28			+ ·576	+ ·573	14·7

The solution of these equations with the values of n_1 as the absolute term gave—

		Weight.			Weight.
α	= − 0″·0663	129	α'	= + 0″·7810	172
β	− ·0382	920	β'	+ ·0020	1351
γ	− ·0068	3404	γ'	− ·0147	4797
dL	− ·1027	139	dL	− ·1019	15

and, in the mean, having regard to the weights, dL = − 0″·1026 : weight 154.

The corresponding values of x' and y' are given in columns 3 and 6 of the accompanying table for the epoch of each group and its limits, and from these the values of a, a', b and b' are easily derived as follows :—

The value of x' on June 10·0 gives the Equation $x' - 1a + 1a'$ = + 0·083
11·0 ,, ,, x' = + 0·078
15·0 ,, ,, $x' + 4a + 16a'$ = − 0·002

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Whence, for Group I; $a = -0{\cdot}0080$; $a' = -0{\cdot}0030$, as given in columns 4 and 5 respectively. The values of b and b' are similarly found. For Group II. we take similarly x' and y' for the Epochs June 15, 17 and 19; for Group III., x' and y' for the Epochs June 19, 22 and 26; and so on.

DETERMINATION OF THE CONSTANTS a, b, a' AND b'.

1	2		3	4	5	6	7	8
Group.	Date.		x'	a	a'	y'	b	b'
	June	10·0	+ 0·083			+ 0·596		
I.		11·0	+ ·078	− ·0080	− ·0030	+ ·617	+ ·0203	− ·0007
		15·0	− ·002	(− ·0088)	(− ·0028)	+ ·686	(+ ·0126)	(− ·0004)
II.		17·0	− ·054	− ·0245	+ ·0009	+ ·704	+ ·0098	+ ·0004
		19·0	− ·099	(− ·0211)	(+ ·0017)	+ ·725	(+ ·0045)	(− ·0005)
III.		22·0	− ·125	− ·0010	+ ·0022	+ ·746	+ ·0070	·0000
		26·0	− ·097	(− ·0014)	(+ ·0023)	+ ·774	(+ ·0074)	(+ ·0007)
IV.		29·0	− ·037	+ ·0205	+ ·0003	+ ·806	+ ·0118	+ ·0004
	July	3·0	+ ·051	(+ ·0196)	(+ ·0001)	+ ·859	(+ ·0154)	(+ ·0003)
V.		6·0	+ ·079	+ ·0007	− ·0028	+ ·908	+ ·0147	− ·0006
		9·0	+ ·056	(− ·0012)	(− ·0034)	+ ·947	(+ ·0137)	(− ·0007)
VI.		11·0	+ ·001	− ·0325	− ·0025	+ ·964	+ ·0068	− ·0008
		12·0	− ·034	(− ·0310)	(− ·0030)	+ ·970	(·0000)	(− ·0010)
		15·0	− ·137			+ ·965		
VII.		18·0	− ·196	− ·0120	+ ·0025	+ ·944	− ·0086	− ·0006
		20·0	− ·210	(− ·0114)	(+ ·0034)	+ ·925	(− ·0083)	(− ·0001)
VIII.		21·5	− ·201	+ ·0077	+ ·0011	+ ·917	− ·0070	− ·0011
		23·0	− ·187	(+ ·0069)	(+ ·0033)	+ ·904	(− ·0044)	(+ ·0007)
IX.		24·0	− ·169	+ ·0170	− ·0005	+ ·895	− ·0060	+ ·0030
		25·0	− ·153	(+ ·0150)	(+ ·0030)	+ ·892	(− ·0020)	(+ ·0050)
X.		26·0	− ·134	+ ·0195	+ ·0005	+ ·889	− ·0027	+ ·0003
		28·0	− ·093	(+ ·0165)	(− ·0005)	+ ·885	(+ ·0007)	(+ ·0007)
XI.	August	1·0	− ·047	+ ·0017	− ·0024	+ ·885	+ ·0004	+ ·0001
		4·0	− ·064	(+ ·0010)	(− ·0030)	+ ·887	(+ ·0012)	(− ·0005)
XII.		7·0	− ·143	− ·0316	− ·0017	+ ·871	− ·0083	− ·0009
		10·0	− ·253	(− ·0310)	(− ·0019)	+ ·838	(− ·0100)	(− ·0010)
XIII.		13·0	− ·336	− ·0193	+ ·0027	+ ·781	− ·0194	− ·0001
		17·0	− ·370	(− ·0196)	(+ ·0029)	+ ·701	(− ·0215)	(+ ·0006)
XIV.		19·0	− ·352	+ ·0102	+ ·0007	+ ·659	− ·0186	+ ·0011
		22·0	− ·315	(+ ·0078)	(+ ·0014)	+ ·613	(− ·0134)	(+ ·0010)
XV.		24·0	− ·285	+ ·0134	− ·0007	+ ·589	− ·0115	+ ·0003
		27·0	− ·251	(+ ·0111)	(− ·0012)	+ ·557	(− ·0059)	(+ ·0003)

It will be seen that these values of a, b, a' and b' agree very closely with the originally adopted values (which are printed in brackets below them), and therefore

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we may regard the last found values as final approximations, with which the definitive values of x' and y' may be computed.

The substitution of these definitive values of a, b, a' and b' in the original expressions for x' and y' furnishes the values of x' and y' which are given in the column n_2 of the equations to determine α, β, γ, α', β', γ', and dL.

The resulting definitive normal equations are—

$$
\begin{array}{rrrrl}
273{\cdot}8\,\alpha & +\ 137{\cdot}8\,\beta & +\ 1085{\cdot}9\,\gamma & +\ 42{\cdot}9\,dL & =\ -\ 36{\cdot}1 \\
137{\cdot}8 & +\ 1085{\cdot}9 & +\ 937{\cdot}4 & -\ 51{\cdot}9 & =\ -\ 53{\cdot}8 \\
1085{\cdot}9 & +\ 937{\cdot}4 & +\ 8145{\cdot}6 & +\ 349{\cdot}1 & =\ -\ 204{\cdot}7 \\
42{\cdot}9 & -\ 51{\cdot}9 & +\ 349{\cdot}1 & +\ 162{\cdot}8 & =\ -\ 20{\cdot}4 \\
387{\cdot}2\,\alpha' & +\ 100{\cdot}5\,\beta' & +\ 1485{\cdot}5\,\gamma' & +\ 28{\cdot}74\,dL & =\ +\ 277{\cdot}7 \\
100{\cdot}5 & +\ 1485{\cdot}5 & +\ 1056{\cdot}6 & -\ 9{\cdot}59 & =\ +\ 67{\cdot}3 \\
1485{\cdot}5 & +\ 1056{\cdot}6 & +\ 10813{\cdot}2 & +\ 113{\cdot}66 & =\ +\ 991{\cdot}0 \\
28{\cdot}74 & -\ 9{\cdot}59 & +\ 113{\cdot}66 & +\ 17{\cdot}47 & =\ +\ 19{\cdot}0
\end{array}
$$

and their solution gives—

α =	− 0″·0671	Weight 129	α' =	+ 0″·7810	Weight 172
β =	− ·0399	„ 920	β' =	+ ·0020	„ 1351
γ =	− ·0071	„ 3404	γ' =	− ·0147	„ 4797
dL =	− 0″·1047	„ 139	dL =	− 0″·1019	„ 15

Mean value of dL = − 0″·104.

With these values of α, β, γ, α', β', γ' and dL the corresponding values of x' and y' were computed for each day and interpolated for the epoch of each equation. The approximately exact values of x' and y' thus found were then substituted in each equation, and from the resulting residuals, it is then possible to deduce the systematic corrections to the distances which appear in symbolical terms on the right hand side of the original equations, ± the small accidental errors depending on the errors of the star-places, the accidental errors of observation and the errors of x' and y' of the corrected ephemeris. The value of z is already known to be very small, and its effect on the corrections nearly disappears in the mean of the equations, because the coefficient of z has different values and different signs in the different equations ; and, as the distance of the planet was observed from many different stars, and at very different dates, the errors of the star-places and of the corrected ephemeris also practically disappear in the determination of the systematic corrections.

But in the reduction of so great a mass of observations it was possible, notwithstanding every care and the duplicate computation of every part of the work which

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could not otherwise be independently checked, that some error might have escaped the repeated scrutiny of every apparent discrepancy, or that some undetected source of systematic error may have affected the results of a particular night. On the latter ground several sets have been rejected for reasons given in the footnotes.

It has been assumed that κ (the angle between the components of the artificial double star formed in "crossing through") is a constant for each observer for all distances in the same circumstances of definition. From a very detailed study of the question, with the present results before me, I find that this is not practically the case. In measures of distances less than 300″ to 400″ the observer begins to become conscious of the curvature of the motion of star-images in "crossing through," and he tries to observe "true bisections," or rather to limit his usual range of motion in position-angle so as to make the discs just emerge from behind each other and no more. In other words his value of κ in measuring very small distances tends to become smaller than its normal value, whilst in such distances the effect of an error in the estimated value of κ produces a considerable error in the amount of the necessary correction. After very careful discussion of the matter, I came to the conclusion that there is a greater chance of increasing than of diminishing the error of the final result by including equations based on measures of distance less than 250″, unless in such measures κ is measured also for each pointing.

The equations available for determining the systematic errors depending on the distance, and on the reciprocal of the distance (that is to say, the small terms a, A, g, G, e, E, &c., which appear on the right hand side of the original equations) are then the following—

Set.	Star.	C–O.	Weight.	O–C Corrected.	Set.	Star.	C–O.	Weight.	O–C Corrected.
AUWERS (Single Distances).					AUWERS (Single Distances)—*continued.*				
VI. 1	x	$0{\cdot}81\,a + 1{\cdot}23\,A_2 = +0'{\cdot}13$	5·88	$+0'{\cdot}01$					
VIII. 1	q	$1{\cdot}18\,a + 0{\cdot}85\,A_2 = +\ {\cdot}06$	5·20	$+\ {\cdot}05$	III. 6	θ	$0{\cdot}97\,a + 1{\cdot}03\,A_2 = +0'{\cdot}21$	1·92	$-0'{\cdot}09$
VIII. 5	q	$0{\cdot}56\,a + 1{\cdot}79\,A_1 = +\ {\cdot}24$	2·61	$-\ {\cdot}06$	VII. 4	t	$0{\cdot}64\,a + 1{\cdot}56\,A_2 = +\ {\cdot}12$	2·61	$+\ {\cdot}04$
XI. 4	m	$0{\cdot}69\,a + 1{\cdot}45\,A_2 = +\ {\cdot}10$	2·61	$+\ {\cdot}05$	X. 2	p	$0{\cdot}53\,a + 1{\cdot}89\,A_2 = +\ {\cdot}13$	4·30	$+\ {\cdot}05$
XII. 1	g	$0{\cdot}72\,a + 1{\cdot}39\,A_2 = +\ {\cdot}27$	3·54	$-\ {\cdot}12$	X. 3	p	$0{\cdot}35\,a + 2{\cdot}86\,A_2 = +\ {\cdot}22$	3·54	$+\ {\cdot}05$
XII. 3	f	$0{\cdot}64\,a + 1{\cdot}56\,A_2 = +\ {\cdot}30$	4·30	$-\ {\cdot}14$	X. 6	p	$1{\cdot}04\,a + 0{\cdot}96\,A_2 = +\ {\cdot}10$	3·31	$+\ {\cdot}02$
XII. 4	f	$0{\cdot}34\,a + 1{\cdot}47\,A_2 = +\ {\cdot}22$	4·30	$-\ {\cdot}08$	XIII. 7	e	$0{\cdot}63\,a + 1{\cdot}59\,A_2 = +\ {\cdot}10$	2·61	$+\ {\cdot}06$
XV. 3	d	$0{\cdot}52\,a + 1{\cdot}92\,A_2 = +\ {\cdot}08$	2·61	$+\ {\cdot}11$	XIV. 5	d	$0{\cdot}95\,a + 1{\cdot}05\,A_2 = +\ {\cdot}22$	5·20	$-\ {\cdot}10$
XV. 5	d	$0{\cdot}51\,a + 1{\cdot}96\,A_2 = +\ {\cdot}17$	2·61	$+\ {\cdot}02$	XV. 2	d	$0{\cdot}62\,a + 1{\cdot}61\,A_2 = +\ {\cdot}15$	4·30	$+\ {\cdot}01$
XV. 7	d	$0{\cdot}82\,a + 1{\cdot}22\,A_1 = -\ {\cdot}03$	4·40	$+\ {\cdot}17$					

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Set.	Star.	C–O.	Weight.	O–C Corrected.
		Gill (Single Distances).		
		″		″
III. 1	λ	1·06 g +0·94 G_1 = +0·09	2·19	+0·01
V. 4	z	0·79 g +1·27 G_1 = − ·05	2·74	+ ·18
VII. 5	t	0·89 g +1·12 G_1 = + ·16	2·74	− ·04
VIII. 3	q	0·55 g +1·82 G_1 = + ·21	4·49	− ·03
X. 5	p	0·84 g +1·90 G_1 = + ·35	2·74	− ·16
XII. 2	f	0·79 g +1·27 G_1 = + ·15	4·49	− ·02
XV. 1	d	0·64 g +1·56 G_1 = + ·12	2·74	+ ·04
III. 5	θ	0·73 g +1·37 G = + ·20	2·74	− ·06
VIII. 2	q	0·95 g +1·05 G_2 = + ·24	2·74	− ·13
X. 1	p	0·67 g +1·49 G_2 = + ·03	2·74	+ ·12
XIII. 6	e	0·56 g +1·79 G_2 = + ·06	2·74	+ ·12
XV. 4	d	0·51 g +1·96 G_2 = + ·34	3·25	− ·14
XV. 6	d	0·77 g +1·30 G_2 = + ·12	2·74	+ ·01
X. 4	p	0·45 g +2·22 G_3 = + ·24	1·95	− ·02
XIII. 4	e	0·75 g +1·33 G_3 = − ·02	3·36	− ·16
		Elkin (Single Distances).		
		″		″
III. 7	λ	1·31 e +0·76 E = +0·62	0·75	−0·22
III. 11	θ	0·59 e +1·69 E = + ·90	0·75	− ·33
V. 14	z	0·93 e +1·08 E = + ·76	1·07	− ·32
VI. 6	w	0·71 e +1·41 E = + ·21	1·07	+ ·29
VII. 9	u	0·51 e +1·96 E = + ·71	1·07	− ·09
VII. 14	t	0·89 e +1·12 E = + ·32	1·38	+ ·12
VIII. 7	q	0·94 e +1·06 E = − ·06	0·57	+ ·49
VIII. 9	q	0·39 e +2·56 E = + ·84	1·38	− ·06
VIII. 10	q	0·72 e +1·39 E = + ·71	1·38	− ·21
X. 8	p	0·45 e +2·22 E = + ·90	1·07	− ·21
XII. 10	g	0·69 e +1·45 E = + ·36	1·38	+ ·15
XII. 13	f	0·34 e +2·94 E = + ·25	0·39	+ ·62
XIII. 14	e	0·63 e +1·57 E = + ·54	0·39	− ·01
XIII. 15	e	0·68 e +1·47 E = + ·06	0·75	+ ·45
XV. 8	d	0·58 e +1·72 E = + ·81	0·39	− ·25

Set.	Star.	C–O.	Weight.	O–C Corrected.
		Hall (Single Distances).		
		″		″
III. 8	λ	1·34 h +0·75 H_2 = +0·62	0·45	−0·25
III. 12	θ	0·55 h +1·82 H_2 = + ·02	0·31	+ ·36
V. 10	z	0·55 h +1·82 H_2 = + ·22	0·31	+ ·16
V. 13	z	0·86 h +1·16 H_1 = + ·51	0·86	− ·17
VII. 8	v	0·44 h +2·27 H_2 = + ·61	1·12	− ·18
VII. 15	t	1·00 h +1·00 H_1 = + ·07	0·73	+ ·27
VIII. 8	q	0·41 h +2·44 H_2 = + ·53	1·12	− ·08
X. 7	p	0·52 h +1·92 H_2 = + ·20	1·35	+ ·17
		Hartwig (Single Distances).		
		″		″
VII. 17	t	+0·83 h_g +1·21 H_g = +0·17	0·39	(−0·17)
VIII. 11	q	+0·99 h_g +1·01 H_g = − ·06	0·39	(+ ·06)
VIII. 12	q	+0·66 h_g +1·52 H_g = + ·19	0·20	(− ·19)
XI. 17	m	+0·68 h_g +1·47 H_g = − ·21	0·39	(+ ·21)
		Peter (Single Distances).		
		″		″
III. 13	λ	+1·24 p +0·81 P = −0·10	1·08	0·00
III. 16	θ	+0·48 p +2·08 P = + ·36	1·08	− ·37
III. 17	θ	+0·86 p +1·16 P = − ·15	1·83	+ ·09
V. 8	z	+0·71 p +1·41 P = + ·37	1·08	− ·42
XI. 10	m	+0·71 p +1·41 P = − ·20	1·49	+ ·16
XIII. 8	e	+1·36 p +0·74 P = − ·27	0·59	+ ·16
XIII. 10	e	+0·67 p +1·49 P = − ·03	2·14	− ·01
XIII. 11	e	+0·62 p +1·61 P = − ·08	2·14	+ ·05
XIV. 10	d	+0·96 p +1·04 P = − ·15	1·08	+ ·08
XV. 9	d	+0·62 p +1·61 P = + ·02	1·49	− ·05

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Set.	Stars.	C–O.	Weight.	O–C Corrected.
		Schur (Single Distances).		
		″		″
III. 20	θ	+0·47 s +2·12 S = +1·14	0·69	—0·24
III. 21	θ	+0·84 s +1·19 S = +0·21	0·69	+ ·23
VI. 8	x	+0·74 s +1·35 S = +0·80	0·69	— ·27
XI. 15	m	+0·69 s +1·45 S = +0·52	0·69	+ ·06
XII. 14	g	+0·71 s +1·41 S = +0·67	0·69	— ·11
XII. 15	f	+0·66 s +1·52 S = +0·58	0·35	+ ·03
XIII. 17	f	+1·43 s +0·70 S = +0·27	0·35	— ·10
XIII. 18	e	+0·63 s +1·59 S = +0·64	0·69	·00
XV. 10	d	+0·61 s +1·64 S = +0·62	0·35	+ ·05
XV. 11	d	+0·62 s +1·61 S = +0·09	0·35	+ ·56
		Auwers (Double Distances).		
		″		″
III. 3	θλ	+ 0·33 A_2 = + 0·300	3·84	—0·271
IV. 1	ελ	— ·02 A_2 = — ·015	3·36	+ ·013
IV. 4	ελ	+ ·06 A_2 = + ·031	3·36	— ·026
IV. 5	ηζ	— ·04 A_1 = — ·141	3·36	+ ·137
IV. 8	γλ	+ ·02 A_1 = + ·017	3·16	— ·015
IV. 9	εδ	+ ·08 A_1 = + ·002	5·06	+ ·005
IV. 12	yθ	·00 A_2 = + ·178	3·36	— ·178
IV. 13	ηα	+ ·01 A_2 = — ·048	4·08	+ ·049
V. 2	γα	+ ·02 A_1 = — ·099	4·08	+ ·101
V. 6	x	+ ·18 A_1 = + ·016	3·31	·000
,,	y	+ ·18 A_1 = — ·069	3·31	+ ·085
,,	z	— ·23 A_1 = — ·136	3·31	+ ·116
IX. 2	pq	+ ·18 A_2 = + ·015	6·62	+ ·001
IX. 3	rn	+ ·02 A_2 = — ·060	4·08	+ ·062
XI. 1	pm	+ ·25 A_1 = + ·056	6·62	— ·034
XI. 5	km	+ ·27 A_1 = — ·134	3·84	+ ·158
XIII. 2	fe	+ ·19 A_2 = — ·059	3·84	+ ·076
XIII. 3	fe	— ·16 A_2 = + ·087	6·62	— ·101
II. 1	μθ	+ ·02 A_2 = + ·198	1·80	— ·196
II. 2	μθ	— ·08 A_2 = — ·189	3·36	+ ·182
V. 1	βδ	— ·03 A_2 = — ·172	4·08	+ ·169
VI. 2	xw	+ ·01 A_2 = + ·004	6·62	— ·003
VII. 7	tq	·00 A_2 = — ·163	3·32	+ ·163
XIV. 3	fa	— ·03 A_2 = — ·220	5·06	+ ·217
XIV. 6	eb	+ ·23 A_2 = — ·008	6·62	+ ·028

In Set V. 6 three distances were measured, and the term *a* was eliminated.

Set.	Stars.	C–O.	Weight.	O–C Corrected.
		Gill (Double Distances).		
		″		″
II. 3	μθ	— 0·13 G_1 = + 0·037	5·48	—0·050
IV. 6	γλ	+ ·00 G_1 = + ·231	5·48	— ·231
IV. 7	ηζ	— ·07 G_1 = + ·044	5·48	— ·051
IV. 10	yθ	— ·07 G_1 = + ·024	5·48	— ·031
VII. 6	tq	+ ·19 G_1 = + ·033	5·48	— ·014
IX. 1	rn	+ ·08 G_1 = + ·008	5·48	·000
XI. 6	km	+ ·02 G_1 = — ·190	5·48	+ ·192
XI. 7	ki	+ ·35 G_1 = + ·144	3·10	— ·109
I. 1	κμ	+ ·04 G_2 = — ·243	3·10	+ ·247
III. 2	θλ	— ·06 G_2 = + ·101	3·10	— ·107
III. 4	θλ	+ ·47 G_2 = — ·090	1·66	+ ·137
IV. 2	ιζ	+ ·03 G_2 = — ·271	3·10	+ ·274
IV. 3	ιζ	+ ·02 G_2 = — ·112	5·48	+ ·114
XI. 3	om	— ·01 G_2 = + ·124	5·48	— ·125
XIII. 1	fe	+ ·35 G_2 = + ·054	5·48	— ·019
XIV. 2	fa	— ·01 G_2 = — ·071	5·48	+ ·070
IV. 11	εδ	— ·02 G_3 = — ·048	2·12	+ ·046
IV. 14	yθ	+ ·05 G_3 = + ·151	3·90	— ·146
IX. 4	pq	— ·40 G_3 = + ·153	2·12	— ·193
XI. 2	pm	— ·12 G_3 = — ·100	2·12	+ ·088
XIV. 4	cd	+ ·33 G_3 = + ·020	3·90	+ ·013
		Peter (Double Distances).		
		″		″
II. 4	θμ	+ 0·06 P = — 0·101	2·16	+0·102
II. 5	θμ	+ ·12 P = — ·085	3·66	+ ·087
III. 14	θλ	— ·06 P = — ·251	1·18	+ ·250
III. 15	θλ	+ ·36 P = — ·123	3·66	+ ·128
IV. 15	ελ	— ·02 P = — ·113	3·66	+ ·113
IV. 16	γλ	— ·02 P = — ·218	2·16	+ ·218
IV. 17	γλ	+ ·02 P = — ·050	1·18	+ ·050
IV. 18	yθ	— ·08 P = + ·002	3·66	— ·003
VI. 3	xy	+ ·27 P = + ·030	2·16	— ·026
VI. 4	wx	+ ·32 P = + ·088	1·18	— ·084
IX. 5	pq	— ·24 P = — ·230	1·18	+ ·227
XI. 8	nl	·00 P = — ·094	2·16	+ ·094
XI. 9	om	— ·54 P = + ·337	3·66	— ·344

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Set.	Stars.	C–O.			Weight.	O–C Corrected.
Peter (Double Distances)—*continued*.						
				″		″
XI. 11	km	+ 0·22 P	=	+ 0·002	2·16	+0·001
XIII. 9	fe	— ·30 P	=	+ ·161	2·16	— ·165
XIV. 7	fa	+ ·03 P	=	— ·210	2·16	+ ·210
XIV. 8	cd	+ ·12 P	=	+ ·150	2·16	— ·148
XIV. 9	fa	— ·01 P	=	— ·182	3·66	+ ·182
Elkin (Double Distances).						
				″		″
II. 7	$\mu\theta$	— 0·13 E	=	— 0·132	1·50	+0·095
III. 9	$\theta\lambda$	+ ·47 E	=	+ ·383	1·50	— ·251
IV. 20	$\epsilon\lambda$	+ ·06 E	=	— ·031	1·50	+ ·048
IV. 21	$\gamma\lambda$	+ ·02 E	=	— ·111	1·50	+ ·117
IV. 22	$\eta\zeta$	— ·08 E	=	— ·260	1·50	+ ·238
V. 9	$\beta\delta$	+ ·04 E	=	— ·004	2·14	+ ·015
IX. 7	rn	+ ·05 E	=	+ ·028	1·50	— ·014
IX. 8	pq	— ·39 E	=	— ·070	1·50	— ·040
XI. 13	hi	+ ·97 E	=	— ·080	0·78	+ ·353
XIII 12	fe	+ ·15 E	=	+ ·101	0·78	— ·059
XIII. 13	fe	— ·35 E	=	+ ·100	0·78	— ·198
XIV. 11	cd	— ·02 E	=	+ ·096	2·14	— ·102
XIV. 12	fa	+ ·02 E	=	+ ·048	1·50	— ·042
XIV. 13	cd	+ ·15 E	=	+ ·281	1·50	— ·239
XIV. 14	eb	+ ·17 E	=	+ ·244	1·50	— ·196
IV. 19	$\epsilon\lambda$	·00 E_3	=	+ ·003	1·82	— ·003
XI. 12	ki	+ ·14 E_3	=	+ ·454	1·50	— ·415

Set.	Stars.	C–O.			Weight.	O–C Corrected.
Hall (Double Distances).						
				″		″
II. 6	$\mu\theta$	— 0·08 H	=	— 0·428	1·20	+0·416
III. 10	$\theta\lambda$	+ ·50 H	=	+ ·098	0·62	— ·022
IX. 6	pq	+ ·18 H	=	— ·146	0·90	+ ·173
IX. 9	rn	·00 H	=	— ·012	0·90	+ ·012
XI. 14	hi	+ ·04 H	=	+ ·110	0·62	— ·104
Schur (Double Distances).						
				″		″
I. 2	$\kappa\mu$	+ 0·07 S	=	— 0·132	0·70	+0·163
II. 8	$\theta\mu$	+ ·13 S	=	+ ·274	0·70	— ·216
III. 19	$\theta\lambda$	+ ·39 S	=	— ·022	1·38	+ ·196
IV. 23	$\epsilon\lambda$	— ·02 S	=	+ ·246	1·38	— ·255
V. 15	$\beta\delta$	+ ·02 S	=	— ·001	1·38	+ ·010
VI. 7	xy	+ ·30 S	=	+ ·272	0·70	— ·138
VI. 9	wx	+ ·23 S	=	+ ·214	1·38	— ·111
XI. 16	km	+ ·19 S	=	+ ·133	1·38	— ·048
XIV. 15	cd	— ·05 S	=	— ·043	1·38	+ ·021
XIV. 17	eb	+ ·29 S	=	— ·142	1·38	+ ·271
Hartwig (Double Distances).						
					″	″
IV. 24	$\epsilon\lambda$	— 0·01 H_g	=	— 0·334	0·40	+0·336

These equations were fully discussed with respect to the systematic difference of the value of κ for each observer according to the distance observed, and the quality of the definition. The general result of the discussion is, that, except for the very short distances (which are excluded), κ may be regarded as practically a constant for each observer and, so far as our data for its determination are concerned, is independent of the quality of definition. In other words, we may put $A = A_1 = A_2 = A_3$, $G = G_1 = G_2 = G_3$, &c.

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The normal equations are—

From Auwers' Observations.

Single Distances	$21{\cdot}61\ a + 35{\cdot}94\ A_{1-2} = +3{\cdot}62$	$35{\cdot}94\ a + 79{\cdot}44\ A_{1-2} = +8{\cdot}64$
	$15{\cdot}52 + 27{\cdot}80\ A_3 = +3{\cdot}22$	$27{\cdot}80 + 79{\cdot}19\ A_3 = +7{\cdot}27$
Double Distances	... ...	$2{\cdot}08\ A_{1-2} = +0{\cdot}33$
	... ...	$0{\cdot}37\ A_3 = +0{\cdot}10$
	$37{\cdot}13\ a + 63{\cdot}74\ A = +6{\cdot}84$	$63{\cdot}74\ a + 161{\cdot}08\ A = +16{\cdot}34$

From Gill's Observations.

Single Distances	$13{\cdot}55\ g + 23{\cdot}77\ G_1 = +2{\cdot}59$	$23{\cdot}77\ g + 48{\cdot}46\ G_1 = +5{\cdot}48$
	$10{\cdot}73 + 22{\cdot}20\ G_{2-3} = +2{\cdot}14$	$22{\cdot}20 + 55{\cdot}67\ G_{2-3} = +5{\cdot}42$
Double Distances	... ...	$0{\cdot}76\ G_1 = +0{\cdot}11$
	... ...	$1{\cdot}05\ G_2 = -0{\cdot}06$
	... ...	$0{\cdot}80\ G_3 = -0{\cdot}04$
	$24{\cdot}28\ g + 45{\cdot}97\ G = +4{\cdot}73$	$45{\cdot}97\ g + 106{\cdot}74\ G = +10{\cdot}91$

From Elkin's Observations.

Single Distances	$7{\cdot}34\ e + 13{\cdot}76\ E = +4{\cdot}94$	$13{\cdot}76\ e + 39{\cdot}27\ E = +12{\cdot}99$
Double Distances	... ...	$+1{\cdot}53 = +0{\cdot}49$
	$7{\cdot}34\ e + 13{\cdot}76\ E = +4{\cdot}94$	$13{\cdot}76\ e + 40{\cdot}80\ E = +13{\cdot}48$

From Hall's Observations.

Single Distances	$3{\cdot}09\ h + 6{\cdot}17\ H = +1{\cdot}53$	$6{\cdot}17\ h + 21{\cdot}47\ H = +4{\cdot}43$
Double Distances	... ...	$0{\cdot}20 = +0{\cdot}05$
	$3{\cdot}09\ h + 6{\cdot}17\ H = +1{\cdot}53$	$6{\cdot}17\ h + 21{\cdot}67\ H = +4{\cdot}48$

From Peter's Observations.

Single Distances	$9{\cdot}04\ p + 14{\cdot}02\ P = -0{\cdot}60$	$14{\cdot}02\ p + 28{\cdot}56\ P = -0{\cdot}03$
Double Distances	... ...	$2{\cdot}29 = -0{\cdot}78$
	$9{\cdot}04\ p + 14{\cdot}02\ P = -0{\cdot}60$	$14{\cdot}02\ p + 30{\cdot}85 = -0{\cdot}81$

From Schur's Observations.

Single Distances	$3{\cdot}08\ s + 5{\cdot}51\ S = +2{\cdot}16$	$5{\cdot}51\ s + 12{\cdot}70\ S = +5{\cdot}25$
Double Distances	... ...	$+0{\cdot}52 = +0{\cdot}10$
	$3{\cdot}08\ s + 5{\cdot}51\ S = +2{\cdot}16$	$5{\cdot}51\ s + 13{\cdot}22\ S = +5{\cdot}35$

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Hartwig's observations are not sufficiently numerous to afford a reliable determination of their systematic errors. His observations of single distances are satisfactorily represented in the mean without correction, whilst his solitary observation of double distance is represented well within the limits implied by its weight.

The solution of these equations gives the following values for the constants of the systematic corrections :—

	″				″		
a =	+ 0·033	weight	11·9 ;	A =	+ 0·089	weight	51·7
g =	+ ·007	„	4·5 ;	G =	+ ·099	„	19·6
e =	+ ·144	„	2·7 ;	E =	+ ·281	„	15·0
h =	+ ·188	„	1·3 ;	H =	+ ·152	„	9·3
p =	− ·086	„	2·7 ;	P =	+ ·013	„	9·1
s =	− ·103	„	0·8 ;	S =	+ ·446	„	3·4

The corresponding corrections which occur in the single distances may be taken from the following table :—

Distance.	Auwers.	Gill.	Elkin.	Hall.	Peter.	Schur.
″	″	″	″	″	″	″
400	+ 0·236	+ 0·250	+ 0·760	+ 0·455	− 0·002	+ 1·074
600	+ ·168	+ ·168	+ ·555	+ ·365	− ·030	+ 0·683
800	+ ·137	+ ·130	+ ·466	+ ·341	− ·053	+ 0·475
1000	+ ·122	+ ·106	+ ·425	+ ·340	− ·073	+ 0·343
1200	+ ·116	+ ·092	+ ·406	+ ·352	− ·092	+ 0·246

In the double distances, the factors of A, G, E, &c., are very small, and produce little influence on the result. Whether the origin of the terms A, G, E, &c. (that is to say, the terms depending on the reciprocal of the distance) can be entirely ascribed to the measurement of cos s instead of s seems very doubtful.

In the case of Dr. Schur's observations, where S = 0″·446, this implies that—

$$\frac{\kappa^2}{2000} = + 0''\cdot446$$

$$\text{whence} \quad \kappa = 29''\cdot9$$

or in other words, that in "crossing through," Dr. Schur makes an artificial double star, whose distance is 29″·9. I accordingly wrote to Dr. Schur on the subject, and in reply he stated that, in his normal habit of observing, κ did not exceed 7″. It is hardly possible to imagine that so experienced an observer as Dr. Schur

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could be mistaken in this estimate to anything like the extent in question, nor indeed is it probable that Dr. Elkin "crosses through" so far as to make $\kappa = 23''\cdot7$, which is implied by a value of $E = +\ 0''\cdot281$.

The explanation of the negative corrections required by Dr. Peter's observations of short distances is probably to be found in the fact that they were nearly always made in a non-illuminated field, and, therefore, when often he could not see the guiding wires. In such a case, instead of observing cos s he would be obliged to observe sec s (that is, to make the two images replace each other), and his observations would in consequence require a negative correction. On the other hand, in many cases, although the field was not artificially illuminated, the guiding wires would be rendered visible by moonlight or twilight, when he would probably measure cos s instead of s, and his observations would require a positive correction. There can be little doubt that it is to a combination of these circumstances that the mean systematic corrections to his observations are so small, but there are not sufficient data for separating the two classes of observations, and the mean corrections must be adopted.

As to the reality of the corrections applicable to short distances there is no doubt, nor have I been able to find any empirical law that better represents them. The question of their true origin remains an interesting and important one for future investigation. For the present purpose it is sufficient to state that a small constant error in these corrections has an entirely insignificant effect on the resulting parallax, because the parallax factors enter into the equations from the single distances with every variety of sign. Any error in the systematic corrections has thus only the effect of increasing the accidental probable error of the result, without sensibly affecting the result itself. The value of "O–C corrected for systematic error" is given for each equation in the right hand column (pp. 419–422) adjoining its weight.

The Single Distances in which ψ was measured are represented as follows :—

Auwers (Single Distances when ψ observed).					Gill (Single Distances when ψ observed).				
Set.	Star.	s.	O–C.	Weight.	Set.	Star.	s.	O–C.	Weight.
			″					″	
VIII. 4	q	0·42	—0·36	2·61	VII. 2	t	0·13	+0·12	2·74
XII. 7	f	·30	+0·25	3·70	XII. 5	f	·21	— ·16	2·74
					XII. 6	f	·16	+ ·31	1·55
					XIII. 5	e	·24	+ ·03	2·74

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The Single Position-Angles are represented as follows :—

Set.	Definition.	O–C.	Weight.	Set.	Definition.	O–C.	Weight.	Set.	O–C.	Weight.
AUWERS (Single Position-Angles).				GILL (Single Position-Angles).				ELKIN (Single Position-Angles).		
		″				″			″	
VII. 20	3	—0·01	3·70	III. 25	2	—0·28	1·47	III. 27	—0·11	1·13
VII. 21	3	— ·05	2·61	V. 16	1	— ·05	3·31	III. 31	+ ·25	2·09
VIII. 13	2	+ ·20	5·20	VI. 10	1	— ·22	1·47	V. 19	— ·22	1·13
VIII 16	2	+ ·10	4·30	VII. 19	1	+ ·23	3·70	V. 22	+ ·16	1·63
VIII. 17a	2	+ ·05	3·54	VII. 22	1	— ·07	1·92	VI. 13	+ ·21	1·63
X. 10	3	— ·01	2·61	VIII. 14	2	— ·04	3·31	VII. 26	— ·32	1·63
X. 11	1	+ ·07	2·61	VIII. 15	1	+ ·25	3·31	VII. 28	— ·11	2·09
X. 13	2	— ·21	3·31	VIII. 17b	2	— ·04	1·47	VII. 29	+ ·26	2·09
XI. 20	2	— ·12	2·61	X. 9	1	— ·03	4·30	VIII. 18	— ·30	1·63
XII. 16	1	+ ·10	4·30	X. 12	1	— ·02	3·31	VIII. 20	— ·18	1·13
XII. 18	1	— ·16	4·30	XII. 17	1	— ·05	3·31	VIII. 21	+ ·06	1·13
XII. 19	1	— ·26	2·19	XII. 20	1	+ ·03	3·70	X. 15	+ ·02	1·63
XII. 22	2	— ·03	3·70	XII. 21	1	+ ·02	3·70	XII. 24	— ·31	1·13
XII. 23	2	+ ·10	4·30	XIII. 23	1	+ ·22	2·61	XII. 25	— ·03	1·63
XIII. 25	3	— ·11	4·30	XIII. 24	3	+ ·23	1·30	XII. 26	— ·09	0·87
XV. 13	2	— ·12	2·61	XV. 12	2	+ ·02	4·30	XII. 27	— ·10	1·13
XV. 14	3	— ·08	2·61	XV. 15	2	+ ·03	2·61	XIII. 28	— ·01	1·13
XV. 16	3	— ·01	2·61	XV. 17	3	+ ·10	0·83	XIII. 29	— ·38	1·13
XV. 18	1	— ·15	5·20					XV. 19	+ ·23	1·39

Set.	O–C.	Weight.	Set.	O–C.	Weight.	Set.	O–C.	Weight.
SCHUR (Single Position-Angles).			HALL (Single Position-Angles).			PETER (Single Position-Angles).		
	″			″			″	
III. 33	—0·15	0·65	III. 28	+0·13	0·55	III. 37	+0·33	0·59
III. 35	— ·14	·65	III. 32	— ·19	·37	III. 38	+ ·31	1·49
III. 36	— ·45	·65	V. 20	— ·10	·55	III. 40	+ ·28	1·83
VI. 16	+ ·16	·65	V. 21	— ·48	·28	V. 23	+ ·28	0·59
XI. 29	+ ·21	·65	VI. 12	+ ·51	·47	VIII. 22	— ·01	1·83
XII. 29	+ ·20	·65	VII. 25	— ·89	·37	XI. 26	+ ·03	1·08
XIII. 33	— ·38	·65	VII. 27	+ ·04	·55	XI. 27	— ·34	0·59
XV. 21	— ·35	·33	VII. 30	— ·32	·89	XIII. 31	+ ·23	1·08
XV. 22	— ·27	·65	VIII. 19	— ·10	·72	XV. 20	+ ·29	1·49

Set.	O–C.	Weight.	Set.	O–C.	Weight.
HARTWIG (Single Position-Angles).			HARTWIG (Single Position-Angles)—*continued.*		
VII. 31	+0·04	0·59	VIII. 24	—0·23	0·59
VIII. 23	+ ·40	·59	XI. 30	— ·16	·59

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The Double Position-Angles are represented as follows :—

AUWERS (Double Position-Angles).				GILL (Double Position-Angles).				ELKIN (Double Position-Angles).		
Set.	Definition.	O–C.	Weight.	Set.	Definition.	O–C.	Weight.	Set.	O–C.	Weight.
		″				″			″	
II. 9	2	+0·16	1·80	II. 10	2	+0·06	1·80	III. 29	—0·03	2·26
II. 11	2	·00	1·80	III. 22	2	+ ·03	3·84	XI. 24	— ·57	1·18
III. 23	1	— ·04	3·84	III. 24	1	— ·10	3·84	XI. 25	— ·22	1·18
VII. 24	3	— ·25	3·84	VII. 23	1	— ·15	3·84	XIII. 26	+ ·09	2·26
IX. 11	2	— ·03	6·62	IX. 10	1	— ·13	2·24	XIII. 27	+ ·01	2·26
XI. 18	1	+ ·07	6·62	IX. 12	1	— ·04	3·84			
XI. 21	1	+ ·09	6·62	XI. 19	3	— ·21	2·68	PETER (Double Position-Angles).		
XIII. 20	1	·00	6·62	XI. 22	1	+ ·09	3·84			
XIII. 21	3	·00	3·84	XI. 23	1	+ ·11	3·84	II. 12	—0·19	1·18
				XIII. 19	3	+ ·09	1·92	VI. 14	— ·02	2·98
				XIII. 22	3	— ·10	1·66	IX. 14	— ·26	1·18
								XI. 28	+ ·09	2·16
								XIII. 30	+ ·01	1·18

HALL (Double Position-Angles).			SCHUR (Double Position-Angles).			HARTWIG (Double Position-Angles).		
III. 30	—0·26	0·38	III. 34	—0·35	1·30	VI. 17	—0·15	0·60
IX. 13	·00	·56	VI. 15	+ ·15	1·30	XI. 31	+ ·07	1·18
XI. 25a	+ ·24	·38	XIII. 32	— ·19	1·30	XII. 31	+ ·15	1·18

These corrected values of O–C now become the absolute terms in a new solution to determine x' and y', which includes, instead of excludes, the single distances, and in which the tabular motion may be regarded as so nearly exact that $\Delta x'$ and $\Delta y'$ may without sensible error be assumed constant during each group, and consequently the terms a, b, a' and b' (expressing the variation of x' and y' within the limits of each group) may be disregarded.

The resulting normal equations are then the following—

Group I*.

$$+3{\cdot}81\,S - 1{\cdot}56\,z = +0{\cdot}88''$$
$$-1{\cdot}56 + 1{\cdot}44 = -0{\cdot}43$$

Group II.

$$+10{\cdot}87\,\Delta x' - 6{\cdot}17\,\Delta y' + 2{\cdot}69\,z = +0{\cdot}01$$
$$-6{\cdot}17 + 15{\cdot}05 + 1{\cdot}57 = +0{\cdot}26$$
$$+2{\cdot}69 + 1{\cdot}57 + 13{\cdot}77 = +0{\cdot}14$$

Group III.

$$+27{\cdot}74\,\Delta x' - 0{\cdot}23\,\Delta y' + 10{\cdot}70\,z = -1{\cdot}11''$$
$$-0{\cdot}23 + 30{\cdot}17 - 4{\cdot}69 = -0{\cdot}49$$
$$+10{\cdot}70 - 4{\cdot}69 + 20{\cdot}17 = +0{\cdot}14$$

Group IV.

$$+20{\cdot}08\,\Delta x' - 15{\cdot}64\,\Delta y' - 0{\cdot}35\,z = -0{\cdot}68$$
$$-15{\cdot}64 + 53{\cdot}55 + 17{\cdot}80 = +3{\cdot}50$$
$$-0{\cdot}35 + 17{\cdot}80 + 36{\cdot}68 = +3{\cdot}68$$

* As only distances from 2 stars were measured in Group I. x' and y' cannot be separated. S denotes here the correction to the position of the planet in the direction of a line joining the comparison stars.

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Group V.

$$
\begin{array}{llll}
+14{\cdot}75\,\Delta x' & -0{\cdot}23\,\Delta y' & +6{\cdot}17\,z & =+1{\cdot}93 \\
-0{\cdot}23 & +20{\cdot}32 & +3{\cdot}11 & =-0{\cdot}60 \\
+6{\cdot}17 & +3{\cdot}11 & +12{\cdot}89 & =+0{\cdot}59
\end{array}
$$

Group VI.

$$
\begin{array}{llll}
+11{\cdot}74\,\Delta x' & -1{\cdot}73\,\Delta y' & +0{\cdot}96\,z & =-1{\cdot}03 \\
-1{\cdot}73 & +16{\cdot}72 & +0{\cdot}69 & =-0{\cdot}48 \\
+0{\cdot}96 & +0{\cdot}69 & +17{\cdot}60 & =+1{\cdot}03
\end{array}
$$

Group VII.

$$
\begin{array}{llll}
+22{\cdot}42\,\Delta x' & -1{\cdot}30\,\Delta y' & +2{\cdot}73\,z & =-1{\cdot}57 \\
-1{\cdot}30 & +25{\cdot}52 & +4{\cdot}44 & =-3{\cdot}37 \\
+2{\cdot}73 & +4{\cdot}44 & +20{\cdot}61 & =-0{\cdot}98
\end{array}
$$

Group VIII.

$$
\begin{array}{llll}
+25{\cdot}43\,\Delta x' & -0{\cdot}25\,\Delta y' & +5{\cdot}28\,z & =+0{\cdot}98 \\
-0{\cdot}25 & +25{\cdot}84 & +5{\cdot}54 & =-2{\cdot}81 \\
+5{\cdot}28 & +5{\cdot}54 & +22{\cdot}29 & =-0{\cdot}21
\end{array}
$$

Group IX.

$$
\begin{array}{llll}
+18{\cdot}95\,\Delta x' & +4{\cdot}71\,\Delta y' & -0{\cdot}82\,z & =+0{\cdot}28 \\
+4{\cdot}71 & +19{\cdot}32 & +8{\cdot}00 & =+0{\cdot}23 \\
-0{\cdot}82 & +8{\cdot}00 & +17{\cdot}72 & =-0{\cdot}88
\end{array}
$$

Group X.

$$
\begin{array}{llll}
+18{\cdot}48\,\Delta x' & +0{\cdot}52\,\Delta y' & +1{\cdot}46\,z & =+0{\cdot}97 \\
+0{\cdot}52 & +20{\cdot}25 & +8{\cdot}75 & =-0{\cdot}83 \\
+1{\cdot}46 & +8{\cdot}75 & +15{\cdot}02 & =-0{\cdot}21
\end{array}
$$

Group XI.

$$
\begin{array}{llll}
+39{\cdot}50\,\Delta x' & +3{\cdot}92\,\Delta y' & +6{\cdot}17\,z & =-0{\cdot}51 \\
+3{\cdot}92 & +39{\cdot}08 & +5{\cdot}74 & =+3{\cdot}62 \\
+6{\cdot}17 & +5{\cdot}74 & +35{\cdot}08 & =-0{\cdot}47
\end{array}
$$

Group XII.

$$
\begin{array}{llll}
+29{\cdot}35\,\Delta x' & +0{\cdot}17\,\Delta y' & +1{\cdot}42\,z & =-3{\cdot}88 \\
+0{\cdot}17 & +34{\cdot}03 & +12{\cdot}38 & =+0{\cdot}75 \\
+1{\cdot}42 & +12{\cdot}38 & +24{\cdot}58 & =+0{\cdot}69
\end{array}
$$

Group XIII.

$$
\begin{array}{llll}
+33{\cdot}62\,\Delta x' & +2{\cdot}01\,\Delta y' & +4{\cdot}21\,z & =-0{\cdot}84 \\
+2{\cdot}01 & +35{\cdot}46 & +6{\cdot}16 & =-0{\cdot}65 \\
+4{\cdot}21 & +6{\cdot}16 & +27{\cdot}51 & =+0{\cdot}46
\end{array}
$$

Group XIV.

$$
\begin{array}{llll}
+19{\cdot}52\,\Delta x' & +5{\cdot}16\,\Delta y' & +0{\cdot}67\,z & =-1{\cdot}77 \\
+5{\cdot}16 & +24{\cdot}64 & +1{\cdot}96 & =-2{\cdot}66 \\
+0{\cdot}67 & +1{\cdot}96 & +20{\cdot}08 & =+0{\cdot}20
\end{array}
$$

Group. XV.

$$
\begin{array}{llll}
+24{\cdot}64\,\Delta x' & +0{\cdot}59\,\Delta y' & -7{\cdot}01\,z & =+0{\cdot}32 \\
+0{\cdot}59 & +25{\cdot}16 & +8{\cdot}33 & =-1{\cdot}00 \\
-7{\cdot}01 & +8{\cdot}33 & +14{\cdot}16 & =-1{\cdot}38
\end{array}
$$

The solution of these normals gives the following results (including all descriptions of observations):—

Group.	Values of $\Delta x'$ for the various Groups.	Weight.	Values of $\Delta y'$ for the various Groups.	Weight.	Value of z according to each Group.	Weight.
I.					—0·088	0·80
II.	+ 0·014 — 0·40 z	8·34	+ 0·023 — 0·27 z	11·55	+ ·005	12·27
III.	— ·040 — ·38	27·74	— ·017 + ·15	30·17	+ ·032	15·34
IV.	+ ·022 — ·31	15·51	+ ·072 — ·42	41·37	+ ·082	29·24
V.	+ ·130 — ·42	14·75	— ·028 — ·16	20·32	— ·013	9·80
VI.	— ·093 — ·09	11·56	— ·038 — ·05	16·46	+ ·065	17·48
VII.	— ·078 — ·13	22·35	— ·136 — ·18	25·48	— ·008	19·45
VIII.	+ ·037 — ·21	25·43	— ·108 — ·22	25·84	+ ·010	19·98
IX.	+ ·013 + ·16	17·80	+ ·009 — ·45	18·15	— ·067	13·97
X.	+ ·054 — ·07	18·47	— ·042 — ·43	20·24	+ ·007	11·16
XI.	— ·022 — ·14	39·11	+ ·095 — ·13	38·69	— ·026	33·44
XII.	— ·132 — ·05	29·35	+ ·023 — ·36	34·03	+ ·030	20·01
XIII.	+ ·026 — ·11	33·51	— ·020 — ·17	35·34	+ ·018	25·99
XIV.	— ·066 — ·01	18·44	— ·094 — ·08	23·27	+ ·022	19·92
XV.	+ ·014 — ·28	24·63	— ·040 — ·34	25·15	— ·071	13·29

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Having regard to the weights we obtain in the mean

$$z = +\ 0{\cdot}0105, \text{ weight } 262{\cdot}14.$$

Substituting this value of z in the 15 equations for z, we have the *mean error* of an observation of weight unity

$$\frac{[p\,vv]}{n-1} = 0{\cdot}0328$$

$$\text{or } \epsilon = \pm\ 0''{\cdot}181.$$

The weights of the different observations were computed on the basis of an estimated value of $\epsilon = \pm\ 0''{\cdot}20$ for weight unity, but this estimate in every case allowed for the error of the star's place, and for accidental error of the ephemeris, both of which sources of error would be nearly eliminated by approximately simultaneous observations from the same star in both hemispheres. The parallax might on this account be expected to come out with a probable error rather smaller than its estimated error, as has actually occurred.

We have thus

$$z = +\ 0{\cdot}0105 \text{ with } \textit{mean error} \pm 0{\cdot}0112$$

and the Mean Solar Horizontal Parallax = **8″·809**: Probable Error ± 0″·0066.

The separate results being—

Group.	π	Difference from Mean.	Relative Weight.	Group.	π	Difference from Mean.	Relative Weight.
		″			″	″	
I.	8·723	— 0·086	0·8	IX.	8·742	— 0·067	14·0
II.	·804	— ·005	12·3	X.	·806	— ·003	11·2
III.	·828	+ ·019	15·4	XI.	·777	— ·032	33·4
IV.	·872	+ ·063	29·2	XII.	·826	+ ·017	20·0
V.	·789	— ·020	9·8	XIII.	·816	+ ·007	26·0
VI.	·857	+ ·048	17·5	XIV.	·819	+ ·010	19·9
VII.	·793	— ·016	19·5	XV.	·738	— ·071	13·3
VIII.	·809	·000	20·0				

But the Cape Observations taken alone furnish an independent value of the parallax by the diurnal method, which, although neither the latitude of the observatory nor the declination of the planet are very favourable for the purpose, yet give a valuable control on the probable freedom of the work from systematic error.

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The Cape Observations alone furnish the following normal equations :—

Group II.

$$+ 7{\cdot}07\,\Delta x' - 2{\cdot}45\,\Delta y' - 1{\cdot}18\,z = + 0{\cdot}35''$$
$$- 2{\cdot}45 + 8{\cdot}63 + 7{\cdot}91 = + 0{\cdot}18$$
$$- 1{\cdot}18 + 7{\cdot}91 + 7{\cdot}48 = + 0{\cdot}22$$

Group III.

$$+ 13{\cdot}52\,\Delta x' + 1{\cdot}42\,\Delta y' + 5{\cdot}64\,z = - 1{\cdot}27$$
$$+ 1{\cdot}42 + 14{\cdot}65 + 7{\cdot}90 = + 0{\cdot}42$$
$$+ 5{\cdot}64 + 7{\cdot}90 + 8{\cdot}66 = - 0{\cdot}57$$

Group IV.

$$+ 13{\cdot}65\,\Delta x' - 7{\cdot}82\,\Delta y' - 8{\cdot}80\,z = - 1{\cdot}25$$
$$- 7{\cdot}82 + 42{\cdot}16 + 29{\cdot}50 = + 3{\cdot}90$$
$$- 8{\cdot}80 + 29{\cdot}50 + 24{\cdot}51 = + 3{\cdot}18$$

Group V.

$$+ 10{\cdot}68\,\Delta x' + 0{\cdot}42\,\Delta y' + 4{\cdot}67\,z = + 1{\cdot}05$$
$$+ 0{\cdot}42 + 13{\cdot}43 + 8{\cdot}76 = - 0{\cdot}16$$
$$+ 4{\cdot}67 + 8{\cdot}76 + 7{\cdot}92 = + 0{\cdot}11$$

Group VI.

$$+ 5{\cdot}41\,\Delta x' - 0{\cdot}19\,\Delta y' - 0{\cdot}15\,z = - 0{\cdot}25$$
$$- 0{\cdot}19 + 8{\cdot}57 + 8{\cdot}77 = + 0{\cdot}19$$
$$- 0{\cdot}15 + 8{\cdot}77 + 9{\cdot}44 = + 0{\cdot}35$$

Group VII.

$$+ 17{\cdot}56\,\Delta x' - 0{\cdot}46\,\Delta y' + 1{\cdot}70\,z = - 0{\cdot}89$$
$$- 0{\cdot}46 + 17{\cdot}48 + 10{\cdot}72 = - 2{\cdot}67$$
$$+ 1{\cdot}70 + 10{\cdot}72 + 15{\cdot}30 = - 1{\cdot}44$$

Group VIII.

$$+ 19{\cdot}84\,\Delta x' + 0{\cdot}79\,\Delta y' + 3{\cdot}81\,z = + 0{\cdot}89$$
$$+ 0{\cdot}79 + 18{\cdot}79 + 11{\cdot}49 = - 2{\cdot}77$$
$$+ 3{\cdot}81 + 11{\cdot}49 + 16{\cdot}62 = - 0{\cdot}44$$

Group IX.

$$+ 14{\cdot}41\,\Delta x' + 4{\cdot}04\,\Delta y' - 1{\cdot}06\,z = + 0{\cdot}55''$$
$$+ 4{\cdot}04 + 16{\cdot}22 + 11{\cdot}19 = - 0{\cdot}15$$
$$- 1{\cdot}06 + 11{\cdot}19 + 14{\cdot}08 = - 0{\cdot}46$$

Group X.

$$+ 16{\cdot}33\,\Delta x' + 0{\cdot}91\,\Delta y' - 1{\cdot}33\,z = + 0{\cdot}97$$
$$+ 0{\cdot}91 + 18{\cdot}34 + 10{\cdot}51 = - 0{\cdot}83$$
$$+ 1{\cdot}33 + 10{\cdot}51 + 13{\cdot}24 = - 0{\cdot}33$$

Group XI.

$$+ 28{\cdot}39\,\Delta x' + 2{\cdot}86\,\Delta y' + 8{\cdot}50\,z = - 1{\cdot}87$$
$$+ 2{\cdot}86 + 26{\cdot}58 + 17{\cdot}61 = + 1{\cdot}69$$
$$+ 8{\cdot}50 + 17{\cdot}61 + 23{\cdot}10 = + 1{\cdot}26$$

Group XII.

$$+ 24{\cdot}97\,\Delta x' + 0{\cdot}87\,\Delta y' + 0{\cdot}89\,z = - 3{\cdot}91$$
$$+ 0{\cdot}87 + 29{\cdot}07 + 16{\cdot}59 = + 0{\cdot}73$$
$$+ 0{\cdot}89 + 16{\cdot}59 + 20{\cdot}70 = + 0{\cdot}61$$

Group XIII.

$$+ 23{\cdot}80\,\Delta x' + 2{\cdot}06\,\Delta y' + 4{\cdot}47\,z = + 0{\cdot}17$$
$$+ 2{\cdot}06 + 24{\cdot}19 + 16{\cdot}22 = - 0{\cdot}11$$
$$+ 4{\cdot}47 + 16{\cdot}22 + 17{\cdot}87 = + 0{\cdot}18$$

Group XIV.

$$+ 12{\cdot}11\,\Delta x' + 3{\cdot}56\,\Delta y' + 3{\cdot}52\,z = - 1{\cdot}09$$
$$+ 3{\cdot}56 + 13{\cdot}81 + 11{\cdot}97 = - 1{\cdot}31$$
$$+ 3{\cdot}52 + 11{\cdot}97 + 10{\cdot}52 = - 1{\cdot}21$$

Group XV.

$$+ 21{\cdot}76\,\Delta x' + 0{\cdot}44\,\Delta y' - 6{\cdot}04\,z = + 0{\cdot}46$$
$$+ 0{\cdot}44 + 21{\cdot}64 + 10{\cdot}96 = - 1{\cdot}19$$
$$- 6{\cdot}04 + 10{\cdot}96 + 11{\cdot}94 = - 1{\cdot}27$$

The solution of these normals gives the following results :—

CAPE OBSERVATIONS ONLY.

Group.	Values of $\Delta x'$ from the various Groups.	Weight.	Values of $\Delta y'$ from the various Groups.	Weight.	Equation in z after elimination of $\Delta x'$ and $\Delta y'$.
II.	$+ 0{\cdot}063'' - 0{\cdot}17\,z$	6·37	$+ 0{\cdot}039'' - 0{\cdot}96\,z$	7·78	$0{\cdot}05\,z = - 0{\cdot}01$
III.	$- {\cdot}098 - {\cdot}36$	13·38	$+ {\cdot}038 - 0{\cdot}50$	14·50	$2{\cdot}63 = - 0{\cdot}32$
IV.	$- {\cdot}043 + {\cdot}27$	12·20	$+ {\cdot}084 - 0{\cdot}65$	37·68	$2{\cdot}95 = + 0{\cdot}31$
V.	$+ {\cdot}099 - {\cdot}41$	10·67	$- {\cdot}015 - 0{\cdot}64$	13·41	$0{\cdot}39 = - 0{\cdot}22$
VI.	$- {\cdot}046 - {\cdot}01$	5·41	$+ {\cdot}021 - 1{\cdot}02$	8·56	$0{\cdot}48 = + 0{\cdot}16$
VII.	$- {\cdot}055 - {\cdot}11$	17·55	$- {\cdot}154 - 0{\cdot}62$	17·47	$8{\cdot}50 = + 0{\cdot}31$
VIII.	$+ {\cdot}051 - {\cdot}17$	19·81	$- {\cdot}149 - 0{\cdot}60$	18·76	$9{\cdot}04 = + 1{\cdot}08$
IX.	$+ {\cdot}044 + {\cdot}29$	13·40	$- {\cdot}020 - 0{\cdot}76$	15·09	$5{\cdot}26 = - 0{\cdot}19$
X.	$+ {\cdot}062 - {\cdot}05$	16·28	$- {\cdot}048 - 0{\cdot}57$	18·29	$7{\cdot}17 = + 0{\cdot}09$
XI.	$- {\cdot}073 - {\cdot}23$	28·08	$+ {\cdot}071 - 0{\cdot}64$	26·29	$9{\cdot}89 = + 0{\cdot}62$
XII.	$- {\cdot}158 - {\cdot}02$	24·94	$+ {\cdot}030 - 0{\cdot}57$	29·04	$11{\cdot}23 = + 0{\cdot}25$
XIII.	$+ {\cdot}008 - {\cdot}13$	23·62	$- {\cdot}005 - 0{\cdot}66$	24·01	$6{\cdot}60 = + 0{\cdot}23$
XIV.	$- {\cdot}067 - {\cdot}04$	11·19	$- {\cdot}078 - 0{\cdot}86$	12·76	$0{\cdot}13 = - 0{\cdot}04$
XV.	$+ {\cdot}022 + {\cdot}29$	21·75	$- {\cdot}055 - 0{\cdot}51$	21·63	$4{\cdot}59 = - 0{\cdot}53$

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The sum of the equations in z gives

$$68{\cdot}91\ z = +\ 1''{\cdot}75,$$

or

$$z = +\ 0{\cdot}025, \text{ weight } 68{\cdot}91,$$

and

$$\frac{[p\,vv]}{n-1} = 0{\cdot}0372,$$

or the *mean error* of an Observation of weight unity $= \pm\ 0''{\cdot}193$, whence, from the Cape Observations only,

The Mean Solar Horizontal Parallax $= 8''{\cdot}822$: Probable Error $\pm\ 0''{\cdot}014$;

a result which points to entire freedom from systematic difference in the results of observations made in both hemispheres.

We may, therefore, accept with great confidence the mean value of the parallax derived from the whole of the observations of *Victoria* as a very close approximation to the truth, viz. :—

$8''{\cdot}809$: Probable Error $\pm\ 0''{\cdot}0066$.

Reverting now to the separate values of $\Delta x'$ and $\Delta y'$ derived at page 428 from all the observations combined, and at page 430 from the Cape Observations only, it is desirable to determine whether, on the one hand, the introduction of the observations of single distances, or, on the other hand, the employment of the Cape Observations only, produces any effect on the resulting value of the correction of the Lunar Equation, or on the constants of the corrections of the Ephemeris.

For this purpose it is only necessary in the equations for determining α, β, γ, and dL (p.p. 415–416), to substitute for the absolute terms and weights the numerical values and weights of $\Delta x'$ derived from all the observations (page 428),* and for α, β, γ, dL, to write $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$, ΔdL. This done, we obtain by the method of least squares, having regard to the weights, the following normal equations :—

* In computing these numerical equivalents, z was assumed $= +\ 0{\cdot}01$ as derived from all the observations.

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Normal equations to determine $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$, *and* ΔdL *from all the observations at all stations.* (*Right Ascensions.*)

+ 410·0	$\Delta\alpha$	+ 283·9	$\Delta\beta$	+ 1610·2	$\Delta\gamma$	+ 65·7	ΔdL	=	−	5·24″
+ 283·9		+ 1610·2		+ 2213·7		− 49·8		=	−	8·94
+ 1610·2		+ 2213·7		+ 12904·3		+ 367·0		=	−	27·25
+ 65·7		− 49·8		+ 367·0		+ 222·9		=	−	0·75

Similarly, by substituting the corresponding values and weights of $\Delta y'$ (page 428), we obtain—

Normal equations to determine $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma'$ ΔdL *from all the observations at all the stations.* (*Declinations.*)

+ 489·4	$\Delta\alpha'$	+ 225·5	$\Delta\beta'$	+ 1916·9	$\Delta\gamma'$	+ 32·5	ΔdL	=	−	6·66″
+ 225·5		+ 1916·9		+ 2098·0		+ 4·7		=	−	13·13
+ 1916·9		+ 2098·0		+ 14759·3		+ 151·4		=	−	26·51
+ 32·5		+ 4·7		+ 151·4		+ 23·3		=	−	0·82

Further, if similarly, instead of the values of $\Delta x'$ and $\Delta y'$ resulting from all the observations at all the stations, we substitute the values and weights of $\Delta x'$ and $\Delta y'$ found from the Cape Observations only (page 430), we get—

Normal equations to determine $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$ *and* ΔdL *from the Cape Observations only.* (*Right Ascensions.*)

+ 298·4	$\Delta\alpha$	+ 247·2	$\Delta\beta$	+ 1165·2	$\Delta\gamma$	+ 39·7	ΔdL	=	−	5·86″
+ 247·2		+ 1165·2		+ 1897·0		− 31·1		=	−	8·16
+ 1165·2		+ 1897·0		+ 9601·5		+ 167·1		=	−	27·65
+ 39·7		− 31·1		+ 167·1		+ 155·7		=	+	1·76

and

Normal equations to determine $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma'$, *and* ΔdL *from the Cape Observations only.* (*Declinations.*)

+ 355·2	$\Delta\alpha'$	+ 184·1	$\Delta\beta'$	+ 1366·6	$\Delta\gamma'$	+ 27·6	ΔdL	=	−	4·72″
+ 184·1		+ 1366·6		+ 1682·6		− 1·7		=	−	16·14
+ 1366·6		+ 1682·6		+ 10556·6		+ 115·1		=	−	9·48
+ 27·6		− 1·7		+ 115·1		+ 18·3		=	−	1·17

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Whence from these normals—

From all the Observations.		Weight.	From Cape Observations only.		Weight.
	″			″	
$\Delta\alpha =$	− 0·0086	207	$\Delta\alpha =$	− 0·0177	153
$\Delta\beta =$	− ·0035	1169	$\Delta\beta =$	− ·0016	758
$\Delta\gamma =$	− ·0004	5564	$\Delta\gamma =$	+ ·0007	4110
		Weight.			Weight.
†$\Delta dL =$	− ·0009 200 / − ·0225 21	− ·002 221	†$\Delta dL =$	+ ·0162 145 / − ·0667 16	+ ·008 161
$\Delta\alpha' =$	− 0·0135	232	$\Delta\alpha' =$	− 0·0177	169
$\Delta\beta' =$	− ·0064	1600	$\Delta\beta' =$	− ·0151	1073
$\Delta\gamma' =$	+ ·0011	6391	$\Delta\gamma' =$	+ ·0045	4523

These practically identical results, added to the evidence already derived from the parallax, prove conclusively that the position of the planet is determined without systematic difference by the Heliometer observations in both hemispheres. The following are the definitive corrections to the previously adopted tabular errors for the epoch of each group, together with the residuals obtained by substituting the values of $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$, $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma'$, and ΔdL (as derived from all the observations) in the equations from each group.

Group.	Values of $\Delta x'$	Values of $\Delta y'$	Residuals v_x C–O.	Residuals v_y C–O.	Group.	Values of $\Delta x'$	Values of $\Delta y'$	Residuals v_x C–O.	Residuals v_y C–O.
	″	″	″	″		″	″	″	″
II.	− 0·002	+ 0·023	− 0·012	+ 0·003	IX.	− 0·013	− 0·028	− 0·027	− 0·032
III.	− ·003	+ ·009	+ ·041	+ ·024	X.	− ·014	− ·031	− ·067	+ ·016
IV.	− ·004	− ·004	− ·023	− ·072	XI.	− ·016	− ·025	+ ·008	− ·119
V.	− ·005	− ·004	− ·131	+ ·026	XII.	− ·019	− ·017	+ ·114	− ·036
VI.	− ·007	− ·002	+ ·087	+ ·037	XIII.	− ·024	− ·023	− ·049	− ·001
VII.	− ·011	− ·016	+ ·067	+ ·121	XIV.	− ·026	− ·031	+ ·039	+ ·064
VIII.	− ·013	− ·025	− ·048	+ ·086	XV.	− ·028	− ·029	− ·039	+ ·014

These values of $\Delta x'$ and $\Delta y'$ vary so slightly from one group to the next that it is obvious no accuracy has been sacrificed by the assumption that $\Delta x'$ and $\Delta y'$ are constant for each group.

† The upper value of ΔdL comes from the Right Ascensions, the lower from the Declinations.

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With regard to the residuals v_x and v_y, their values in several instances seem to be larger than they should be according to their weights, amounting in some cases to between three and four times their apparent theoretical *mean error*. But these apparent discrepancies are capable of simple explanation.

The theoretical weights only apply rigorously to the separate equations, and not to a combination of a large number of observations of the same star or stars made during a number of different days. As the number of observations in any group increases, the computed weights of the values of $\Delta x'$ and $\Delta y'$ resulting from the group will be higher than their true weights, unless a different star of comparison has been employed for each set of observations in the group. In fact the reverse effect takes place to that which we have found in case of the parallax determination, where the nearly simultaneous employment of the same stars, in the majority of instances, for the Heliometer observations in both hemispheres, eliminated to a considerable extent the error due to the star-places and the Ephemeris. Or in other words, in the case of the parallax determinations we have to deal with measures which are very largely *differential* observations, whilst in the case of $\Delta x'$ and $\Delta y'$ we are dealing entirely with *absolute* determinations. It is not surprising, therefore, to find that the combined errors of the observations, the Ephemeris and the star-places should in one instance out of 28 residuals amount to $0''\cdot13$.

It would have been possible to avoid this departure from a rigorous system of weights by transferring to the right hand side of each equation a symbolical term (with its appropriate co-efficient) denoting the effect on the distance or position-angle of the *mean error* of the star or the stars upon which the equation depends, and a further term depending on the accidental error of the computation of the Ephemeris for each day.

The value of x', y' and z would then be found for each group in terms of these symbols, whose mean errors could then be transformed into numbers, and the weights of x', y' and z be correspondingly modified. But the equations would have thus taken so cumbrous a form (because each star employed involves two symbolic terms, and one symbolic term would be necessary for each day of the Ephemeris), and the whole of this labour would have so small an influence on the result (practically none on the parallax), that after fully considering the matter I dismissed it at the time as unpractical. In the final discussion, however, with a revised Ephemeris these anomalies in the weights are corrected.

The residuals as they stand show no sign of periodicity, and point to a correction of the Lunar Equation as a complete explanation of the periodic variation of x' and y' originally found.

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For the definitive determination of this important constant, it seemed essential that a more accurate Ephemeris of the planet should be computed, beginning with a new Heliocentric Ephemeris of the Earth, in which the Lunar perturbation is computed rigorously from the co-ordinates of the Moon (not by the less exact methods of Leverrier's "Tables du Soleil"), and in which the Ephemeris of the planet is computed with 8-figure logarithms.

Meanwhile it seems probable that Leverrier's value of the Lunar Equation requires a correction approximating to

$$dL + \Delta dL = -\ 0''{\cdot}106.$$
$$\text{or } L = \quad 6''{\cdot}394.$$

The definitive corrections to the Ephemeris are—

$$\Delta\alpha \cos\delta = \frac{a}{\Delta} + \frac{\beta}{10\,\Delta}\,t + \frac{\gamma}{100\,\Delta}\,t^2 + f_x\,dL$$
$$\Delta\delta = \frac{a'}{\Delta} + \frac{\beta'}{10\,\Delta}\,t + \frac{\gamma'}{100\,\Delta}\,t^2 + f_y\,dL$$

Where Δ is the planet's distance from the Earth (the Sun's mean distance from the Earth being reckoned *unity*), and t is the time, in days, in excess of July 18·0—

$$a = -0''{\cdot}0757 \qquad a' = +\ 0''{\cdot}7675.$$
$$\beta = -\ {\cdot}0434 \qquad \beta' = -\ {\cdot}0044.$$
$$\gamma = -\ {\cdot}0075 \qquad \gamma' = -\ {\cdot}0136.$$
$$dL = -\ 0''{\cdot}106.$$

The corresponding corrections are—

Date.		Corr. in R.A.	Corr. in Decl.	Date.		Corr. in R.A.	Corr. in Decl.
		″	″			″	″
June	10	+ 0·089	+ 0·625	July	20	− 0·226	+ 0·906
,,	15	− ·001	+ ·708	,,	25	− ·169	+ ·870
,,	20	− ·118	+ ·747	,,	30	− ·078	+ ·861
,,	25	− ·118	+ ·771	August	4	− ·084	+ ·862
,,	30	− ·016	+ ·817	,,	9	− ·248	+ ·829
July	5	+ ·080	+ ·885	,,	14	− ·390	+ ·734
,,	10	+ ·029	+ ·949	,,	19	− ·393	+ ·636
,,	15	− ·149	+ ·950	,,	24	− ·322	+ ·565

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Notwithstanding the care employed in computing the accidental errors of the various classes of observations, the results do not show that the residuals correspond with the assigned weights. Thus we have—

SINGLE DISTANCES (when ψ not observed).

	$[p\,vv]_1$	n_1	m_1	$\frac{[p\,vv]_1}{n_1-m_1}$	ε_1	Factor.
Auwers	0·4545	18	2	0·0284	± 0·168	1·37
Gill	·4597	15	2	·0354	·188	1·10
Elkin	·9535	15	2	·0733	·271	0·53
Hall	·2368	8	2	·0395	·199	0·99
Peter	·4226	10	2	·0528	·230	0·74
Schur	·2518	10	2	·0315	·177	1·24
Hartwig	·0371	4	2	·0093	·096	4·19

SINGLE DISTANCES (when ψ observed).

Gill	0·8307	6	1	0·1661	± 0·408	0·23

DOUBLE DISTANCES.

Auwers	1·4133	25	1	0·0589	± 0·243	0·66
Gill	1·4240	21	1	·0712	·267	0·55
Elkin	0·7772	17	1	·0486	·220	0·80
Hall	0·2417	5	1	·0604	·246	0·65
Peter	1·1817	18	1	·0695	·264	0·56
Schur	0·3295	10	1	·0366	·191	1·07

SINGLE POSITION-ANGLES.

Auwers	1·0345	19	0	0·0544	± 0·233	0·72
Gill	0·8400	18	0	·0467	·216	0·84
Elkin	1·1994	19	0	·0631	·251	0·62
Hall	0·6072	9	0	·0675	·260	0·58
Peter	0·6491	9	0	·0721	·269	0·54
Schur	0·4119	9	0	·0458	·214	0·85
Hartwig	0·1416	4	0	·0354	·188	1·10

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DOUBLE POSITION-ANGLES.

	$[p\,vv]_1$	n_1	m_1	$\frac{[p\,vv]_1}{n_1-m_1}$	ϵ_1	Factor.
					″	
Auwers	0·3842	9	0	0·0427	± 0·207	0·91
Gill	0·4068	11	0	·0370	·192	1·05
Elkin	0·4610	5	0	·0922	·303	0·42
Hall	0·0476	3	0	·0159	·126	2·45
Peter	0·1412	5	0	·0282	·168	1·38
Schur	0·2355	3	0	·0785	·280	0·50
Hartwig	0·0459	3	0	·0153	·123	2·55

In these Tables the column $[p\,vv]$ gives the sum of the squares of "the residuals multiplied by their weights" for each class of observations by each observer; n_1 is the number of equations; and m_1 the number of unknown quantities which are employed to determine the systematic errors of each group. The next column $\frac{[p\,vv]_1}{n_1-m_1}$ would therefore represent "the square of the mean error of an observation of weight unity," provided that no other unknown quantities had previously been eliminated from the original equations. But the following eight unknown quantities, α, β, γ, α', β', γ', z and dL, enter into the whole of the 306 equations, therefore ϵ_1 (which is $=\sqrt{\frac{[p\,vv]_1}{n_1-m_1}}$) should be smaller than ϵ (the true mean error of an observation of weight *unity*).

In fact, $\frac{[p\,vv]}{n_1-m_1}$ is equivalent to $\frac{[p\,vv]}{n}$, and not to $\frac{[p\,vv]}{n-m}$, where $[p\,vv]$ and n refer to the whole of the 306 equations, and m is = the number of unknown quantities common to all the equations = 8.

Since an estimated mean error = ± 0″·2 has been assumed for an observation of weight unity, we should have

$$\epsilon\epsilon = 0{\cdot}0400 = \frac{[p\,vv]}{306-8}\text{; or } [p\,vv] = 11{\cdot}92.$$

$$\text{and } \frac{[p\,vv]}{n} = 0{\cdot}0390.$$

If, therefore, the weights had been accurately assigned, all the values of $\frac{[p\,vv]_1}{n_1-m_1}$ would have been very approximately = 0·0390. This not being the case,

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the factors by which the adopted weights of the various classes of equations should be multiplied are

$$\frac{0{\cdot}0390}{\frac{[p\,vv]_1}{n_1-m_1}},$$

and these are the factors given in the right hand column of the Table.

For a new solution, in which each equation is to enter with its proper weight in determining the absolute place of the planet, it would be desirable to multiply the previously adopted weights of the equations by these factors; but as a re-discussion of the Lunar Equation, based on a new and more rigorous Ephemeris, must be undertaken, it is unnecessary to incur the labour of solving the existing equations with modified weights. I have, indeed, so far examined the effect of such an operation as to make sure that modified weights would not sensibly affect the resulting value of the parallax.

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CHAPTER IV.

PREPARATION OF A NEW EPHEMERIS OF VICTORIA.

In the preparation of the original Ephemeris, although every care had been employed by Dr. Bohlin to insure accuracy, a close examination proved that in all probability the actual errors of the Heliometer observations in the means of the groups were not much greater than the accidental errors of the Ephemeris. Leverrier's Solar Tables were originally prepared with the object of computing Ephemerides to $0''\cdot1$, and are quite incapable of insuring arithmetical accuracy in the second decimal of the second of arc, nor is it possible to compute the geocentric co-ordinates of a planet from the elements, with all desirable precision for our problem, by the use of seven-figure logarithms only.

Further, for the determination of the Mass of the Moon, it was desirable that the Lunar perturbation of the Earth should be computed, not through Leverrier's development of the Lunar Equation, but with definite Tabular Values of the Solar and Lunar Parallax and the true Longitudes of the Earth and Moon.

With great kindness Dr. Tietjen undertook the work at the office of the *Berliner Jahrbuch*, where it has been carried out under his direction, partly by Dr. Bohlin and partly by Dr. Kurt Laves. He adopted for the Moon's Mass—

$$m' = \frac{1}{83}, \left(\text{or } \frac{m'}{m + m'} = \frac{1}{84}\right); \text{ and for the Mean Solar Parallax, } \pi_0' = 8''\cdot880.$$

Special perturbations of the Earth by *Mercury* were computed with 10-day intervals, and by *Venus*, *Mars*, *Jupiter* and *Saturn* with 20-day intervals. The assumed masses of the planets were as follows :—

Mercury	$\frac{1}{5{,}500{,}000}$	
Venus	$\frac{1}{412{,}150}$	
Mars	$\frac{1}{3{,}093{,}500}$	(Hall.)
Jupiter	$\frac{1}{1047\cdot879}$	
Saturn	$\frac{1}{3501\cdot6}$	

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With the perturbations thus found the places of the Sun given in the *Berliner Jahrbuch* for 1889 June 10 and October 28 were freed from perturbation, and the origin of the co-ordinates for these two dates was transferred from the centre of the Earth to P (the centre of gravity of the Earth and Moon). In this way two places of the Sun, referred to P, were obtained, which may be assumed to be situated on an undisturbed ellipse, one of whose foci is P. From the Longitudes and Radii-vectores of these two places, the elements of the ellipse were deduced, and then the places of the Sun in this ellipse were computed for every two days. The special perturbations were applied to the places of the Sun so computed, and thus the true places of the Sun, referred to the centre of gravity P, were found.

The following checks were applied to these computations :—

1. The computed places of the Sun for June 10 and October 28 had to agree with the corresponding places of the *Berliner Jahrbuch* referred to P.
2. Differencing.
3. The resulting second differences were checked by means of the differential equations—

$$\left.\frac{d^2 x}{d t^2} = -(2k)^2 \frac{x}{r^3}\right\} \text{ where } k \text{ is the mean daily motion.}$$

From the Sun's co-ordinates thus calculated, and the heliocentric co-ordinates of Victoria derived in the way previously described, an Ephemeris of *Victoria* referred to the centre of gravity, P, was computed for every second day. Eight-figure logarithms were used throughout the computations.

From this Ephemeris the place of *Victoria* was interpolated for every day, and corrected to geocentric place as follows :—

$$\text{Let } \kappa_0 = \frac{m'}{m + m'} \pi_0' = \frac{8''\cdot 88}{84}; \qquad \log \kappa_0 = 9\cdot 02413 - 10.$$

$$\delta r = \frac{\kappa_0}{\sin Q} \cos s' \cos (\nu' - \odot)$$

$$r\,\delta \nu = \frac{\kappa_0}{\sin Q} \cos s' \sin (\nu' - \odot)$$

$$r\,\delta s = \frac{\kappa_0}{\sin Q} \sin s'$$

Where

Q is the Moon's true Parallax.
s' ,, Latitude.
ν' ,, Longitude.
r the Earth's Radius Vector.

Q was taken from the *Berliner Jahrbuch* ; s', ν', $\odot$ from the *Nautical Almanac.*

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In order to deduce the corrections for α, δ, and Δ, the following formulæ were computed :—

I.

$$\cos D \cos A = \cos \odot$$
$$\cos D \sin A = \sin \odot \cos \epsilon$$
$$\sin D = \sin \odot \sin \epsilon$$

II.

$$\cos D_1 \cos A_1 = -\sin \odot$$
$$\cos D_1 \sin A_1 = \cos \odot \cos \epsilon$$
$$\sin D_1 = \cos \odot \sin \epsilon$$

where ϵ is the obliquity of the ecliptic.

I.	II.	III.
$\sin n \cos N = \sin D$	$\sin n_1 \cos N_1 = \sin D_1$	$\sin n_2 \cos N_2 = \cos \epsilon$
$\sin n \sin N = \cos D \cos (A - \alpha)$	$\sin n_1 \sin N_1 = \cos D_1 \cos (A_1 - \alpha)$	$\sin n_2 \sin N_2 = -\sin \epsilon \sin \alpha$
$\cos n = \cos D \sin (A - \alpha)$	$\cos n_1 = \cos D_1 \sin (A_1 - \alpha)$	$\cos n_2 = -\sin \epsilon \cos \alpha$

$$a_\alpha = \frac{\cos n}{\Delta \cos \delta} \qquad a_\delta = \frac{\sin n \,.\, \cos (N + \delta)}{\Delta} \qquad a_\Delta = C \sin n \sin (N + \delta)$$

$$b_\alpha = \frac{\cos n_1}{\Delta \cos \delta} \qquad b_\delta = \frac{\sin n_1 \cos (N_1 + \delta)}{\Delta} \qquad b_\Delta = C \sin n_1 \,.\, \sin (N_1 + \delta)$$

$$c_\alpha = \frac{\cos n_2}{\Delta \cos \delta} \qquad c_\delta = \frac{\sin n_2 \cos (N_2 + \delta)}{\Delta} \qquad c_\Delta = C \sin n_2 \sin (N_2 + \delta)$$

$$C = \frac{[1{\cdot}32336]}{\Delta}\text{; where } [1{\cdot}32336] = \log. \text{ (mod. } \sin 1'') + 7.$$

Then we have—

$$\left.\begin{aligned} d\alpha &= a_\alpha dr + b_\alpha r d\nu + c_\alpha r ds \\ d\delta &= a_\delta dr + b_\delta r d\nu + c_\delta r ds \end{aligned}\right\} \text{ in seconds of arc.}$$

$$d (\log \Delta) = a_\Delta dr + b_\Delta r d\nu + c_\Delta r ds \quad \text{in units of the 7th decimal place.}$$

a, b and c were directly computed for every fourth day, and then interpolated for every day ; dr, $rd\nu$, rds were directly computed for every day.

The following is the resulting Geocentric Ephemeris :—

VICTORIA—EPHEMERIS II.

For $12^h{\cdot}0$ Berlin Mean Time.

1889.	α	1st Difference.	2nd Difference.	3rd Difference.	δ	1st Difference.	2nd Difference.	3rd Difference.	Log. Δ	1st Difference.	2nd Difference.
	h m s	s	s		° ′ ″	′ ″	″				
June 5	20 2 51·997				−9 43 34·87				0·0005932		+ 323
		+ 8·718				+10 16·18				−32230	
6	20 3 0·715		−2·094		−9 33 18·69		− 4·59		9·9973702		+ 340
		+ 6·624		+ 2		+10 11·59		−35		−31890	
7	20 3 7·339		−2·092		−9 23 7·10		− 4·94		9·9941812		+ 359
		+ 4·532		− 1		+10 6·65		−33		−31531	
8	20 3 11·871		−2·093		−9 13 0·45		− 5·27		9·9910281		+ 376
		+ 2·439		+ 5		+10 1·38		−34		−31155	
9	20 3 14·310		−2·088		−9 2 59·07		− 5·61		9·9879126		+ 395
		+ 0·351		+ 1		+ 9 55·77		−36		−30760	

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VICTORIA—EPHEMERIS II.—*continued.*

1889.	α	1st Difference.	2nd Difference.	3rd Difference.	δ	1st Difference.	2nd Difference.	3rd Difference.	Log. Δ	1st Difference.	2nd Difference.
	h m s	s	s		° ′ ″	′ ″	″				
June 10	20 3 14·661		−2·087		−8 53 3·30		− 5·97		9·9848366		+ 414
		− 1·736		+ 4		+ 9 49·80		−33		−30346	
11	20 3 12·925		−2·083		−8 43 13·50		− 6·30		9·9818020		+ 432
		− 3·819		+ 5		+ 9 43·50		−39		−29914	
12	20 3 9·106		−2·078		−8 33 30·00		− 6·69		9·9788106		+ 452
		− 5·897		+ 1		+ 9 36·81		−35		−29462	
13	20 3 3·209		−2·077		−8 23 53·19		− 7·04		9·9758644		+ 472
		− 7·974		+10		+ 9 29·77		−40		−28990	
14	20 2 55·235		−2·067		−8 14 23·42		− 7·44		9·9729654		+ 493
		−10·041		+ 6		+ 9 22·33		−39		−28497	
15	20 2 45·194		−2·061		−8 5 1·09		− 7·83		9·9701157		+ 514
		−12·102		+12		+ 9 14·50		−40		−27983	
16	20 2 33·092		−2·049		−7 55 46·59		− 8·23		9·9673174		+ 537
		−14·151		+14		+ 9 6·27		−41		−27446	
17	20 2 18·941		−2·035		−7 46 40·32		− 8·64		9·9645728		+ 560
		−16·186		+21		+ 8 57·63		−41		−26886	
18	20 2 2·7555		−2·014		−7 37 42·69		− 9·06		9·9618842		+ 583
		−18·200		+23		+ 8 48·57		−41		−26303	
19	20 1 44·555		−1·991		−7 28 54·12		− 9·47		9·9592539		+ 609
		−20·191		+28		+ 8 39·10		−42		−25694	
20	20 1 24·364		−1·963		−7 20 15·02		− 9·89		9·9566845		+ 633
		−22·154		+33		+ 8 29·21		−41		−25061	
21	20 1 2·210		−1·930		−7 11 45·81		−10·30		9·9541784		+ 656
		−24·084		+38		+ 8 18·91		−41		−24405	
22	20 0 38·126		−1·892		−7 3 26·90		−10·71		9·9517379		+ 681
		−25·976		+40		+ 8 8·20		−39		−23724	
23	20 0 12·150		−1·852		−6 55 18·70		−11·10		9·9493655		+ 704
		−27·828		+48		+ 7 57·10		−41		−23020	
24	19 59 44·322		−1·804		−6 47 21·60		−11·51		9·9470635		+ 729
		−29·632		+50		+ 7 45·59		−39		−22291	
25	19 59 14·690		−1·754		−6 39 36·01		−11·90		9·9448344		+ 753
		−31·386		+54		+ 7 33·69		−37		−21538	
26	19 58 43·304		−1·700		−6 32 2·32		−12·27		9·9426806		+ 774
		−33·086		+60		+ 7 21·42		−38		−20764	
27	19 58 10·218		−1·640		−6 24 40·90		−12·65		9·9406042		+ 798
		−34·726		+62		+ 7 8·77		−34		−19966	
28	19 57 35·492		−1·578		−6 17 32·13		−12·99		9·9386076		+ 819
		−36·304		+69		+ 6 55·78		−34		−19147	
29	19 56 59·188		−1·509		−6 10 36·35		−13·33		9·9366929		+ 840
		−37·813		+68		+ 6 42·45		−32		−18307	
30	19 56 21·375		−1·441		−6 3 53·90		−13·65		9·9348622		+ 860
		−39·254		+77		+ 6 28·80		−33		−17447	
July 1	19 55 42·121		−1·364		−5 57 25·10		−13·98		9·9331175		+ 879
		−40·618		+76		+ 6 14·82		−27		−16568	
2	19 55 1·503		−1·288		−5 51 10·28		−14·25		9·9314607		+ 898
		−41·906		+81		+ 6 0·57		−26		−15670	
3	19 54 19·597		−1·207		−5 45 9·71		−14·51		9·9298937		+ 913
		−43·113		+82		+ 5 46·06		−26		−14757	
4	19 53 36·484		−1·125		−5 39 23·65		−14·77		9·9284180		+ 929
		−44·238		+87		+ 5 31·29		−22		−13828	
5	19 52 52·246		−1·038		−5 33 52·36		−14·99		9·9270352		+ 944
		−45·276		+85		+ 5 16·30		−19		−12884	
6	19 52 6·970		−0·953		−5 28 36·06		−15·18		9·9257468		+ 957
		−46·229		+89		+ 5 1·12		−19		−11927	
7	19 51 20·7415		−0·864		−5 23 34·94		−15·37		9·9245541		+ 968
		−47·093		+88		+ 4 45·75		−17		−10959	
8	19 50 33·648		−0·776		−5 18 49·195		−15·54		9·9234582		+ 981
		−47·869		+88		+ 4 30·21		−13		− 9978	
9	19 49 45·779		−0·688		−5 14 18·98		−15·67		9·9224604		+ 988
		−48·557		+89		+ 4 14·54		−12		− 8990	
10	19 48 57·222		−0·599		−5 10 4·44		−15·79		9·9215614		+ 998
		−49·156		+89		+ 3 58·75		−13		− 7992	
11	19 48 8·066		−0·510		−5 6 5·69		−15·92		9·9207622		+1005
		−49·666		+89		+ 3 42·83		− 8		− 6987	

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VICTORIA—EPHEMERIS II.—*continued.*

1889.	α	1st Difference.	2nd Difference.	3rd Difference.	δ	1st Difference.	2nd Difference.	3rd Difference.	Log. Δ	1st Difference.	2nd Difference.
	h m s	s	s		° ′ ″	′ ″	″				
July 12	19 47 18·400		−0·421		−5 2 22·86		−16·00		9·9200635		+1014
		−50·087		+ 91		+ 3 26·83		− 9		− 5973	
13	19 46 28·313		−0·330		−4 58 56·03		−16·09		9·9194662		+1021
		−50·417		+ 93		+ 3 10·74		− 6		− 4952	
14	19 45 37·896		−0·237		−4 55 45·29		−16·15		9·9189710		+1026
		−50·654		+ 96		+ 2 54·59		− 4		− 3926	
15	19 44 47·242		−0·141		−4 52 50·70		−16·19		9·9185784		+1032
		−50·795		+ 97		+ 2 38·40		− 4		− 2894	
16	19 43 56·447		−0·044		−4 50 12·30		−16·23		9·9182890		+1036
		−50·839		+101		+ 2 22·17		+ 3		− 1858	
17	19 43 5·608		+0·057		−4 47 50·13		−16·20		9·9181032		+1040
		−50·782		+ 99		+ 2 5·97		+ 2		− 818	
18	19 42 14·826		+0·156		−4 45 44·16		−16·18		9·9180214		+1041
		−50·626		+104		+ 1 49·79		+ 7		+ 223	
19	19 41 24·200		+0·260		−4 43 54·37		−16·11		9·9180437		+1041
		−50·366		+103		+ 1 33·68		+11		+ 1264	
20	19 40 33·834		+0·363		−4 42 20·69		−16·00		9·9181701		+1040
		−50·003		+102		+ 1 17·68		+10		+ 2304	
21	19 39 43·831		+0·465		−4 41 3·01		−15·90		9·9184005		+1038
		−49·538		+105		+ 1 1·78		+17		+ 3342	
22	19 38 54·293		+0·570		−4 40 1·235		−15·73		9·9187347		+1032
		−48·968		+101		+ 0 46·05		+17		+ 4374	
23	19 38 5·325		+0·671		−4 39 15·18		−15·55		9·9191721		+1027
		−48·297		+101		+ 0 30·50		+22		+ 5401	
24	19 37 17·028		+0·772		−4 38 44·68		−15·33		9·9197122		+1018
		−47·525		+ 99		+ 0 15·17		+24		+ 6419	
25	19 36 29·503		+0·871		−4 38 29·51		−15·09		9·9203541		+1011
		−46·654		+ 98		+ 0 0·08		+27		+ 7430	
26	19 35 42·849		+0·969		−4 38 29·43		−14·82		9·9210971		+ 999
		−45·685		+ 96		− 0 14·74		+30		+ 8429	
27	19 34 57·1645		+1·065		−4 38 44·17		−14·52		9·9219400		+ 988
		−44·620		+ 93		− 0 29·26		+32		+ 9417	
28	19 34 12·5445		+1·158		−4 39 13·43		−14·20		9·9228817		+ 972
		−43·462		+ 88		− 0 43·46		+35		+10389	
29	19 33 29·082		+1·246		−4 39 56·89		−13·85		9·9239206		+ 959
		−42·216		+ 87		− 0 57·31		+37		+11348	
30	19 32 46·866		+1·333		−4 40 54·20		−13·48		9·9250554		+ 942
		−40·883		+ 82		− 1 10·79		+38		+12290	
31	19 32 5·983		+1·415		−4 42 4·99		−13·10		9·9262844		+ 924
		−39·468		+ 79		− 1 23·89		+43		+13214	
Aug. 1	19 31 26·515		+1·494		−4 43 28·88		−12·67		9·9276058		+ 906
		−37·974		+ 70		− 1 36·56		+41		+14120	
2	19 30 48·541		+1·564		−4 45 5·44		−12·26		9·9290178		+ 886
		−36·410		+ 71		− 1 48·82		+45		+15006	
3	19 30 12·131		+1·635		−4 46 54·26		−11·81		9·9305184		+ 865
		−34·775		+ 62		− 2 0·63		+44		+15871	
4	19 29 37·356		+1·697		−4 48 54·89		−11·37		9·9321055		+ 844
		−33·078		+ 56		− 2 12·00		+46		+16715	
5	19 29 4·278		+1·753		−4 51 6·89		−10·91		9·9337770		+ 823
		−31·325		+ 56		− 2 22·91		+47		+17538	
6	19 28 32·953		+1·809		−4 53 29·80		−10·44		9·9355308		+ 801
		−29·516		+ 43		− 2 33·35		+45		+18339	
7	19 28 3·437		+1·852		−4 56 3·15		− 9·99		9·9373647		+ 778
		−27·664		+ 45		− 2 43·34		+46		+19117	
8	19 27 35·773		+1·897		−4 58 46·49		− 9·53		9·9392764		+ 756
		−25·767		+ 39		− 2 52·87		+46		+19873	
9	19 27 10·006		+1·936		−5 1 39·36		− 9·07		9·9412637		+ 736
		−23·831		+ 36		− 3 1·94		+44		+20609	
10	19 26 46·175		+1·972		−5 4 41·30		− 8·63		9·9433246		+ 715
		−21·859		+ 34		− 3 10·57		+44		+21324	
11	19 26 24·316		+2·006		−5 7 51·87		− 8·19		9·9454570		+ 693
		−19·853		+ 31		− 3 18·76		+46		+22017	
12	19 26 4·463		+2·037		−5 11 10·63		− 7·73		9·9476587		+ 672
		−17·816		+ 30		− 3 26·49		+43		+22689	

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VICTORIA—EPHEMERIS II.—*continued.*

1889.	α	1st Difference.	2nd Difference.	3rd Difference.	δ	1st Difference.	2nd Difference.	3rd Difference.	Log. Δ	1st Difference.	2nd Difference.
	h m s	s	s		° ′ ″	′ ″	″				
Aug. 13	19 25 46·647		+2·067		−5 14 37·12		− 7·30		9·9499276		+ 653
		−15·749		+29		− 3 33·79		+45		+23342	
14	19 25 30·898		+2·096		−5 18 10·91		− 6·85		9·9522618		+ 632
		−13·653		+25		− 3 40·64		+45		+23974	
15	19 25 17·245		+2·121		−5 21 51·55		− 6·40		9·9546592		+ 611
		−11·532		+25		− 3 47·04		+44		+24585	
16	19 25 5·713		+2·146		−5 25 38·59		− 5·96		9·9571177		+ 591
		− 9·386		+21		− 3 53·00		+47		+25176	
17	19 24 56·327		+2·167		−5 29 31·59		− 5·49		9·9596353		+ 569
		− 7·219		+20		− 3 58·49		+44		+25745	
18	19 24 49·108		+2·187		· 5 33 30·08		− 5·05		9·9622098		+ 549
		− 5·032		+15		− 4 3·54		+45		+26294	
19	19 24 44·076		+2·202		−5 37 33·62		− 4·60		9·9648392		+ 527
		− 2·830		+15		− 4 8·14		+45		+26821	
20	19 24 41·246		+2·217		−5 41 41·76		− 4 15		9·9675213		+ 507
		− 0·613		+10		− 4 12·29		+46		+27328	
21	19 24 40·633		+2·227		−5 45 54·05		− 3·69		9·9702541		+ 485
		+ 1·614		+ 9		− 4 15·98		+44		+27813	
22	19 24 42·247		+2·236		−5 50 10·03		− 3·25		9·9730354		+ 465
		+ 3·850		+ 6		− 4 19·23		+44		+28278	
23	19 24 46·097		+2·242		−5 54 29·26		− 2·81		9·9758632		+ 443
		+ 6·092		+ 4		− 4 22·04		+44		+28721	
24	19 24 52·189		+2·246		−5 58 51·30		− 2·37		9·9787353		+ 422
		+ 8·338		+ 0		− 4 24·41		+44		+29143	
25	19 25 0·527		+2·246		−6 3 15·71		− 1·93		9·9816496		+ 401
		+10·584		− 2		− 4 26·34		+41		+29544	
26	19 25 11·111		+2·244		−6 7 42·05		− 1·52		9·9846040		+ 381
		+12·828		− 5		− 4 27·86		+45		+29925	
27	19 25 23·939		+2·239		−6 12 9·91		− 1·07		9·9875965		+ 362
		+15·067		− 9		− 4 28·93		+41		+30287	
28	19 25 39·006		+2·230		−6 16 38·84		− 0·66		9·9906252		+ 340
		+17·297		− 8		− 4 29·59		+41		+30627	
29	19 25 56·303		+2·222		−6 21 8·43		− 0·25		9·9936879		+ 321
		+19·519		−15		− 4 29·84		+39		+30948	
30	19 26 15·822		+2·207		−6 25 38·27		+ 0·14		9·9967827		+ 300
		+21·725		−17		− 4 29·70		+39		+31248	
31	19 26 37·547		+2·190		−6 30 7·97		+ 0·53		9·9999075		+ 282

The accompanying diagram (Plate III.) shows two curves which represent the excess of the Right Ascension and Declination (in seconds of arc) of Ephemeris II. over the corresponding co-ordinates of Ephemeris I.

The chief differences between the two Ephemerides are due to the employment of different tabular values of the Lunar Equation,—that for Ephemeris I. being Leverrier's value (6″·50), and for Ephemeris II. 6″·3705, the latter corresponding to the tabular values of the Mass of the Moon ($\frac{1}{83}$), and of the Mean Solar Parallax (8″·880)* assumed by Professor Tietjen in computing the Lunar Perturbation of the Earth.

Smaller discordances are accounted for by differences in the adopted tabular masses of planets in computing the perturbations. The irregularities in the curves arise from the use of Leverrier's Solar Tables and of only seven-figure logarithms in the computation of Ephemeris I.

* This tabular value of the Solar Parallax employed in computing the Lunar Perturbation of the Earth is not to be confounded with the tabular value 8″·800 which has been employed in computing the tabular value of the Parallax of the Planet.

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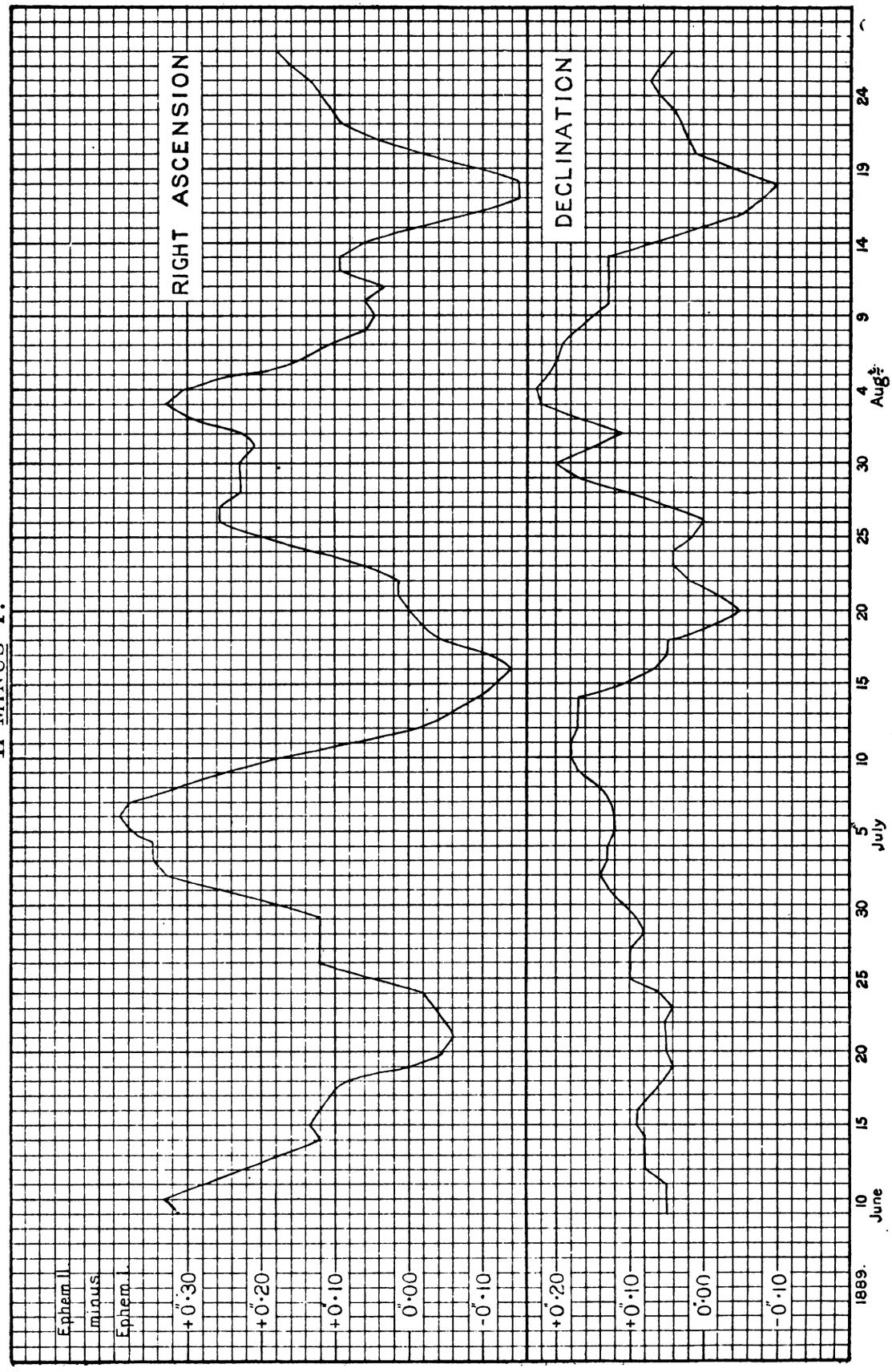
Plate III.

COMPARISON OF THE ORIGINAL EPHEMERIS OF VICTORIA WITH EPHEMERIS II.
II MINUS I.



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CHAPTER V.

DETERMINATION OF PRELIMINARY CORRECTIONS TO EPHEMERIS II.

The New Ephemeris of *Victoria* thus prepared, was compared with the previous one, and the means of the differences taken for each group (these differences are denoted below as C_2–C_1). As the New Ephemeris shows that considerable accidental errors exist in the former one, it has not been considered safe to regard the previous determinations of personality in observing short distances as definitively determined; therefore in determining the preliminary corrections to Ephemeris II the values of x' and y' as derived at pp. 415, 416, under column n_2, have been employed; that is to say, the observations of single distances have been excluded.

In the subsequent Table C_1 denotes the computed Right Ascension or Declination as the case may be, from Dr. Bohlin's Ephemeris; C_2 the computed values from the New Ephemeris; and (O–C_1) the values substituted for n_2 in the Equations on pp. 415, 416.

Group.	Period covered by the Observations.	Mean Epoch.	Right Ascensions.			Declinations.		
			O–C₁	C₂–C₁	O–C₂	O–C₁	C₂–C₁	O–C₂
	1889.	1889.	″	″	″	″	″	″
II.	June 15–June 18	June 17·0	− 0·05	+ 0·10	− 0·15	+ 0·74	+ 0·08	+ 0·66
III.	„ 19– „ 25	„ 22·0	− 0·15	− 0·02	− 0·13	+ 0·67	+ 0·06	+ 0·61
IV.	„ 26–July 2	„ 29·0	− 0·01	+ 0·18	− 0·19	+ 0·88	+ 0·11	+ 0·77
V.	July 3– „ 8	July 6·0	+ 0·16	+ 0·36	− 0·20	+ 0·90	+ 0·13	+ 0·77
VI.	„ 9– „ 12	„ 11·0	− 0·08	+ 0·12	− 0·20	+ 0·88	+ 0·17	+ 0·71
VII.	„ 15– „ 19	„ 18·0	− 0·28	− 0·08	− 0·20	+ 0·82	+ 0·05	+ 0·77
VIII.	„ 20– „ 22	„ 21·5	− 0·16	+ 0·01	− 0·17	+ 0·85	− 0·02	+ 0·87
IX.	„ 23– „ 24	„ 24·0	− 0·17	+ 0·09	− 0·26	+ 0·92	+ 0·04	+ 0·88
X.	„ 25– „ 27	„ 26·0	− 0·10	+ 0·23	− 0·33	+ 0·83	+ 0·02	+ 0·81
XI.	„ 28–Aug. 2	Aug. 1·0	− 0·06	+ 0·23	− 0·29	+ 0·97	+ 0·15	+ 0·82
XII.	Aug. 4– „ 9	„ 7·0	− 0·21	+ 0·18	− 0·39	+ 0·92	+ 0·19	+ 0·73
XIII.	„ 10– „ 16	„ 13·0	− 0·26	+ 0·03	− 0·29	+ 0·80	+ 0·08	+ 0·72
XIV.	„ 17– „ 21	„ 19·0	− 0·47	− 0·07	− 0·40	+ 0·58	− 0·03	+ 0·61
XV.	„ 22– „ 26	„ 24·0	− 0·25	+ 0·12	− 0·37	+ 0·58	+ 0·05	+ 0·53

The values of (O–C_2) thus arrived at, serve to determine the corrections to the New Ephemeris, and they would do so perfectly if the observations were of equal

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weight and symmetrically arranged with respect to the epoch of each group. They serve however, as a whole, to give a series of corrections to the New Ephemeris, so nearly true, that the planet's motion may be considered very nearly known during the period of a single group.

For this purpose it is only necessary to substitute the values of $O-C_2$ in the equations on p. 446 in lieu of the values n_2 * ; this done, the solution of the equations gave the following preliminary corrections to the New Ephemeris :—

Preliminary Correction.

$$\left\{\begin{aligned} x' &= \frac{-0''\cdot1871}{\Delta} - \frac{0''\cdot0309}{10\,\Delta}\,t - \frac{0''\cdot0055}{100\,\Delta}\,t^2 + 0\cdot024 f_x \\ y' &= \frac{+0''\cdot6861}{\Delta} + \frac{0''\cdot0059}{10\,\Delta}\,t - \frac{0''\cdot0128}{100\,\Delta}\,t^2 + 0\cdot024 f_y \end{aligned}\right.$$

where f_x and f_y are the factors of the Lunar Equation in x' and y' for the mean epoch of each group.

The corresponding values of x' and y' were then computed for each day, and tabulated under the heading "Preliminary Corrections to Ephemeris II."

Not only as a check on the previous work, but as an additional control on the accuracy of subsequent computations, the absolute terms of the equations based on Ephemeris II. were formed as follows :—

1. The Berlin Mean Times and the corrections for aberration-time were re-examined, and the Right Ascension and Declination of *Victoria* were interpolated independently from the New Ephemeris for each of the 1627 observations. These Geocentric places, after correction for parallax, were compared with the apparent places used in the duplicate computations of the Tabular Values of Distance and Position-Angle, and the values of (C_1-C_2) were thus formed both for x' and y'. To these were added the preliminary corrections for $\Delta\alpha \cos\delta$ and $\Delta\delta$ with changed sign (computed from the preceding formula) and the corrections x and y, to the Stars' places, derived from the Triangulation ; the sums of these three corrections multiplied by the factors of x' and y' give the required corrections to the absolute terms of the equations, with the arithmetical accuracy of the third decimal, so far as s and p can be computed with that degree of accuracy by seven-figure logarithms.

2. The corrections to the Yale observations of Distance for Division-Error of the

* In the case of the Right Ascensions the values of $(O-C_2)$ are multiplied by $\cos\delta$.

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scales (which were not taken into account in Dr. Elkin's original conversion of the scale-readings into arc) were applied from the following Table :—

Distance.	Correction.	Distance.	Correction.	Distance.	Correction.	Distance.	Correction.
″ ″	″	″ ″	″	″ ″	″	″ ″	″
0 to 500	0·00	2780 to 3300	— 0·03	4560 to 5070	+ 0·03	6080 to 6330	— 0·02
500 „ 1770	— 0·01	3300 „ 3550	— 0·03	5070 „ 5580	+ 0·03	6330 „ 6590	— 0·06
1770 „ 2280	— 0·02	3550 „ 4050	— 0·01	5580 „ 5830	+ 0·02	6590 „ 6850	— 0·12
2280 „ 2780	— 0·04	4050 „ 4560	+ 0·01	5830 „ 6080	0·00		

3. A new discussion of the Equatorial constants of the Leipzig and Göttingen Heliometers seemed to be desirable. In the previous discussion of the Leipzig Position-Angles the corrections were derived graphically from the observations of the Standard Stars, and, in the case of the Göttingen observations, the original value of ψ (Bessel's μ) was deduced from the observations of the horizontal Collimators, whilst the actual observations of the Standard Stars show that a much larger value of ψ is required.

Leipzig Position-Angles.

The observations for the Equatorial adjustments, which are printed at the end of the *Sappho* Observations (Vol. II., p. 270), give the following values of these constants.

1889.	ξ	η	e
	″	″	″
June 6	+ 85·6	+ 10·2	+ 6·6
July 24	+ 84·2	+ 10·7	+ 9·3
Sept. 20	+ 86·3	+ 9·6	+ 9·5
Adopted for the Victoria Observations	+ 85·0	+ 10·0	+ 8·0

The correction is

$$\xi \sec \delta \sin \tau - \eta \sec \delta \cos \tau - e \cos \phi \tan \delta \sin \tau$$

where τ is the hour-angle.

There are no special determinations of the term ψ (which expresses the bending of the cradle of the Heliometer about its point of attachment to the Declination-axis), but this constant can be derived with considerable weight from the observations of the *Victoria* Standard Stars.

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The available observations are given on the left hand side of the following Table, the resulting equations on the right hand side :—

No.	Counter-poise.	Instr. Position-Angle.	Refr. + Aber.	Corr. for Eq. Adj.	Observed Position-Angle.	True P.-A. *minus* Observed.	Resulting Equations.*	$v = \Delta p$	Date.
		186° +		91° +	277° +				1889.
27	prec.	11′ 9″	+ 0′ 4″	+ 0′ 5″	11′ 18″	+ 0′ 36″	I + 0·828 ψ = + 36″	− 4″	June 18
30	prec.	9 38	+ 2 28	− 1 7	10 59	+ 0 55	I + 0·814 = + 55	+ 16	20
34	prec.	11 0	+ 0 46	− 1 35	11 11	+ 0 43	I + 0·826 = + 43	+ 3	
38	foll.	14 24	+ 0 14	− 1 6	14 32	− 2 38	I − 0·829 = − 158	− 16	20
49	prec.	9 25	+ 2 42	− 1 8	10 59	+ 0 55	I + 0·813 = + 55	+ 17	24
54	prec.	11 2	+ 0 35	− 0 26	11 11	+ 0 43	I + 0·828 = + 43	+ 3	
59	foll.	12 43	+ 2 35	− 1 8	14 10	− 2 16	I − 0·814 = − 136	+ 6	25
68	prec.	11 13	+ 0 20	− 0 12	11 21	+ 0 33	I + 0·829 = + 33	− 7	25
70	prec.	11 23	+ 0 10	− 0 2	11 31	− 0 23	I + 0·828 = + 23	− 17	
102	foll.	13 36	+ 1 23	− 0 53	14 6	− 2 12	I − 0·821 = − 132	+ 9	July 7
120	foll.	13 28	+ 2 6	− 1 3	14 31	− 2 37	I − 0·816 = − 157	− 16	21
121	foll.	13 39	+ 1 37	− 0 57	14 19	− 2 25	I − 0·819 = − 145	− 5	
126	foll.	14 1	+ 0 36	− 0 26	14 11	− 2 17	I − 0·828 = − 137	+ 5	
127	foll.	13 55	+ 0 31	− 0 21	14 5	− 2 11	I − 0·828 = − 131	+ 11	
145	foll.	13 20	+ 1 53	− 1 1	14 12	− 2 18	I − 0·818 = − 138	+ 3	31
150	foll.	13 53	+ 0 48	− 0 34	14 7	− 2 13	I − 0·826 = − 133	+ 9	
155	prec.	11 13	− 0 8	+ 0 17	11 22	+ 0 32	I + 0·826 = + 32	− 8	31
167	foll.	14 10	− 0 20	+ 0 26	14 16	− 2 22	I − 0·824 = − 142	0	Aug. 7
179	foll.	13 41	+ 1 30	− 0 55	14 16	− 2 22	I − 0·821 = − 142	0	12
182	foll.	14 11	+ 0 53	− 0 38	14 26	− 2 32	I − 0·826 = − 152	− 9	
217	foll.	14 5	+ 0 7	+ 0 6	14 18	− 2 24	I − 0·828 = − 144	− 2	25

* Where I is the mean correction for index-error.

The value of "True Position-Angle" is that of the Standard Stars (277°. 11′. 54″) derived from the Triangulation.

The resulting normal equations are

$$21{\cdot}00\ \mathrm{I} - 4{\cdot}11\ \psi = -1527$$
$$-4{\cdot}11\ \mathrm{I} + 14{\cdot}24\ \psi = +1783$$

whence

$$\mathrm{I} = -51''{\cdot}1 \qquad \psi = +110''{\cdot}5. \quad \text{Weight } 13{\cdot}4.$$

The application of these corrections to the observed values of p gives corrected observed position-angles such that, if they are assumed without error, the residuals Δp,

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in the right hand column, will be the corrections applicable on account of instantaneous index-error to all observations of the same sitting, if the other position-angles have been first corrected from the following Table.

Leipzig Position-Angles—Corrections for Equatorial Adjustments.

Hour-Angle.	Counterpoise preceding.	Counterpoise following.	Hour-Angle.	Counterpoise preceding.	Counterpoise following.
h	° ′ ″	° ′ ″	h	° ′ ″	° ′ ″
− 4	+ 91 − 0 42	+ 91 − 3 39	0	+ 91 + 0 31	+ 91 − 2 23
− 3	− 0 29	− 3 29	+ 1	+ 0 53	− 2 10
− 2	− 0 12	− 3 13	+ 2	+ 1 14	− 1 48
− 1	+ 0 1	− 2 54	+ 3	+ 1 32	− 1 28
0	+ 0 31	− 2 23	+ 4	+ 1 47	− 1 11

Göttingen Position-Angles.

For Göttingen the available observations of the Standard Stars and the resulting equations are similarly—

No.	Axis.	Instr. Position-Angle.	Refr. + Aber. &c.	Corr. for Eq. Adj.	Observed Position-Angle.	True P.-A. *minus* Observed.	Resulting Equations.	$v = \Delta p$	Date.
		277° +			277° +				1889.
7	foll.	10′ 6″	+ 0′ 47″	+ 1′ 36″	12′ 29″	− 0′ 35″	I − 0·729 ψ = − 35″	− 17″	June 20
26	foll.	10 14	+ 0 20	+ 1 34	12 18	− 0 24	I − 0·726 = − 24	− 6	„ 24
32	foll.	10 30	+ 0 23	+ 1 34	12 27	− 0 33	I − 0·726 = − 33	− 15	„ 25
45	foll.	10 19	+ 0 23	+ 1 34	12 16	− 0 22	I − 0·726 = − 22	− 4	July 9
46	prec.	8 31	+ 0 6	+ 0 54	9 31	+ 2 33	I + 0·727 = + 143	− 6	„ 9
52	foll.	9 58	+ 0 33	+ 1 35	12 6	− 0 12	I − 0·727 = − 12	+ 6	„ 10
66	foll.	10 49	− 0 13	+ 1 23	11 59	− 0 5	I − 0·730 = − 5	+ 13	„ 31
68	prec.	10 32	− 1 26	+ 0 26	9 32	+ 2 22	I + 0·740 = + 144	− 9	„ 31
80	foll.	10 43	− 0 7	+ 1 25	12 1	− 0 7	I − 0·729 = − 7	+ 11	Aug. 5
86b	prec.	11 43	− 2 47	+ 0 14	9 10	+ 2 24	I + 0·747 = + 164	+ 12	„ 8
96	foll.	10 2	+ 0 24	+ 1 34	12 0	− 0 6	I − 0·726 = − 6	+ 12	„ 16

The resulting normal equations are :—

$$+ 11{\cdot}00\, I - 3{\cdot}605\, \psi = 307''$$
$$- 3{\cdot}605\, I + 5{\cdot}853\, \psi = 437{\cdot}73$$

whence

$$I = + 65''{\cdot}7 \qquad \psi = + 115''{\cdot}2$$

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The corresponding corrections are :—

Göttingen Position-Angles—Corrections for Equatorial Adjustments.

Hour-Angle.	Axis preceding.	Axis following.	Hour-Angle.	Axis preceding.	Axis following.
h	′ ″	′ ″	h	′ ″	′ ″
− 4	+ 3 7	+ 0 50	0	+ 3 27	+ 1 17
− 3	+ 3 19	+ 1 5	+ 1	+ 3 20	+ 1 9
− 2	+ 3 26	+ 1 14	+ 2	+ 3 9	+ 0 57
− 1	+ 3 29	+ 1 18	+ 3	+ 2 55	+ 0 40
0	+ 3 27	+ 1 17	+ 4	+ 2 37	+ 0 21

When single comparison stars are employed, the further correction Δp (for the instantaneous index-error) is added to the correction for equatorial adjustments from the above Table.

4. The corrections $\frac{d^2}{2s}$, depending on "the least distance of optical centres of the segments," were omitted in the previous discussion, because they follow the same law as the personal systematic errors A, G, E, &c. But I have thought it desirable in the final discussion to separate purely instrumental corrections from those which are of a personal character. Accordingly the "least distance of optical centres" has been computed from the position-angle observations of each instrument, with the following results :—

		Least distance of centres. d	
		″	
Cape	June 10 to July 31 (inclusive)	3·66	See notes to observations of August 1 and 2, Vol. II., pp. 65 and 68.
	August 1 - - - -	8·78	
	August 2 to end - - -	0·72	
Yale - - - - - - -		1·30	Found to be sufficiently uniform throughout.
Leipzig - - - - - -		2·31	
Göttingen - - - - - -		1·67	
Bamberg - - - -	assumed	0·00	

In computing the absolute terms of the equations resulting from the New Ephemeris, all the corrections were referred back to the original Tables A to K (pp. 270-381), and the work was so arranged that the independent formation of apparent Right Ascension and Declination from the New Ephemeris completely controlled the interpolations from both Ephemerides, as well as the application of the corrections for parallax.

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The absolute terms of the new equations were thus found as follows :—

Let α_1, α_2 be the Right Ascension for the epoch of observation computed from the Old and New Ephemeris respectively.

δ_1, δ_2 the corresponding Declination.

x, y the corrections to the place of the star of comparison, derived from the Triangulation, Table XVI., pp. 222, 223, Column III.

$\Delta\alpha' \cos\delta$ and $\Delta\delta'$ the preliminary corrections applicable to the New Ephemeris derived from the expressions for x' and y' at p. 447 of the present Chapter.

p the true position-angle.

p_1 its observed value with the original equatorial constants.

p_2 " " " revised " "

d the least distance of optical centres of the segments of the object-glass, taken from the preceding Table.

s the observed distance, in seconds of arc, derived from the assumed mean scale-value.

$\Delta\sigma$ the correction, per 1000″ of distance, for instantaneous error of scale-value, derived from observations of Standard Stars (*see* pp. 254-257).

Δp the correction for instantaneous index-error, derived from observations of the Standard Stars (*see* Cape, p. 258, Yale, pp. 259-60, Bamberg, p. 262, Leipzig, p. 449, Göttingen, p. 450).

ψ an observed angle through which the Heliometer has been turned from the true position-angle, when the images of the star and planet are made parallel to a pair of wires placed at right angles to the line of section of the object-glass.

For *Distances* the complete correction to (O–C) is then :—

$$\sin p\,\{(\alpha_1-\alpha_2)\cos\delta + x - \Delta\alpha'\cos\delta\} + \cos p\,(\delta_1-\delta_2+y-\Delta\delta') + \frac{d^2}{2s} + \frac{s}{1000}\Delta\sigma + s\sin^2\tfrac{1}{2}\psi + \left\{\begin{array}{l}\text{In the case of Yale, the}\\ \text{corresponding correction}\\ \text{for division-error.}\end{array}\right.$$

When double distances are observed, the Standard Stars were not observed, and $\Delta\sigma$ is eliminated from the equations depending on observations of stars on opposite sides of the planet (as at p. 393). The correction in ψ occurs only in the cases VIII_4, XII_4, XII_5, XII_6, XII_7, XIII_5. (*See* foot-notes to original equations.)

For *Position-Angles* the complete correction to (O–C) is—

$$\cos p\,\{(\alpha_1-\alpha_2)\cos\delta + x - \Delta\alpha'\cos\delta\} - \sin p\,(\delta_1-\delta_2+y-\Delta\delta') + s.\sin 1''\,(p_2-p_1+\Delta p).$$

When double position-angles are observed, the Standard Stars, as a rule, are not observed, and Δp is eliminated from the observations of stars on opposite sides of the planet. (As at p. 395.)

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As the result of the independent interpolation of α and δ from the New Ephemeris, and the formation of apparent α and δ corresponding to the epoch of each observation—the following errors in the original Tables A, B, C (pp. 270-381) were discovered—

Table.	Page.	Set.	Rotation No.					
						″		″
A	272	IV_2	101	Seconds of appt. Dec. should be		22·80	instead of	23·80
A	274	IV_3	117	,,	,,	4·41	,,	4·21
B	312	VII_{18}	341	,,	,,	23·13	,,	23·63
B	318	XI_{14}	585	,,	,,	35·41	,,	34·41
G	368	XI_{28}	586	,,	,,	35·41	,,	34·41

No errors were found in the formation of the Right Ascensions.

The equations were all independently formed again and controlled by comparison with those employed in the first solution.

Three errors were found, viz :—

In Equation	X_5	the co-efficient of	G	should be	1·19	instead of	1·90
,,	XI_{13}	,,	E	,,	0·06	,,	0·97
,,	XI_{31}	,,	z	,,	+0·71	,,	−0·71

None of these errors produce a sensible effect on the general results of the solution from Ephemeris I., and the original computations have been allowed to remain as they stand, the corrections being of course made in the computations which follow.

In the equations thus formed the "*Preliminary Corrections to Ephemeris II.*" (*see* p. 447) were substituted.

Before solving these equations, an attempt was made to rediscuss the values of the weights previously assigned. Since the errors of the corrected Ephemeris on which the equations are based are probably very small, the absolute terms should represent very nearly the actual residuals resulting from the final solution, provided that the residuals from the single equations are excluded. These latter equations are so considerably affected by the terms depending on the reciprocal of the distance, that it is desirable to obtain nearly definitive corrections of the New Ephemeris before the constants of these terms are discussed. The terms A, G, E, &c., have a very small

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influence on the residuals from the double distances, and, therefore, these terms may be neglected in a preliminary discussion of the weights. In this way the following mean values of $p\upsilon\upsilon$ were found :—

	A	G	E	H	P	S	Hg
Double Distances	0·0495	0·0433	0·0423	0·0675	0·0444	0·0451	
No. of Obs.	(25)	(20)	(17)	(5)	(18)	(9)	
Double Position-Angles	0·0190	0·0311	0·0445	0·0158	0·0233	0·0634	0·0009
No. of Obs.	(9)	(11)	(5)	(3)	(5)	(3)	(3)
Single Position-Angles	0·0396	0·0438	0·0381	0·0486	0·0681	0·0900	0·0131
No. of Obs.	(19)	(18)	(19)	(9)	(9)	(9)	(4)

It is shown at page 437 that if the previous weights had been accurately assigned the mean value of $p\upsilon\upsilon$ should be 0·0390. The above values, in consequence of the greater accuracy of Ephemeris II., approximate more closely to this than do those resulting from the old Ephemeris (*see* pp. 436, 437).

The sum of the squares of the final residuals will necessarily be still smaller, and making allowance for this, and for the unreliability of mean errors derived from a smaller number of observations, the previously adopted weights were multiplied by the following factors :—

	G	A	E	H	P	S	Hg
Double Distances	0·95	0·85	0·95	0·60	0·91	0·90	4·00
Double Position-Angles	1·30	2·00	0·90	1·50	1·00	0·70	4·00
Single Position-Angles	0·95	1·00	1·00	0·85	0·80	0·50	4·00

Rejecting, in the first place, all the observations of single distances (in which class the factors of the personal terms A, G, E, &c., are small), but including all observations of position-angle, normal equations for each group were formed in $\Delta x'$, $\Delta y'$ and z. The latter term (expressing the correction to the Tabular Parallax, 8″·80) was found to be insignificant, and the Supplementary Corrections were found to be—

$$\text{Supplementary Corrections...}\begin{cases} \Delta x' = -\dfrac{0''\cdot0245}{\Delta} + \dfrac{0''\cdot0017}{10\Delta}t + \dfrac{0''\cdot0033}{100\Delta}t^2 + 0''\cdot012\, f'''_x \\ \Delta y' = -\dfrac{0''\cdot0001}{\Delta} - \dfrac{0''\cdot0035}{10\Delta}t + \dfrac{0''\cdot0014}{100\Delta}t^2 + 0''\cdot012\, f'''_y \end{cases}$$

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The observations were then represented as follows :—

Group.	Mean Epoch 1889.		Residuals (O–C)		Group.	Mean Epoch 1889.		Residuals (O–C)	
			In x'	In y'				In x'	In y'
II.	June	17·0	+ 0″·004	+ 0″·049	IX.	July	24·0	+ 0″·031	+ 0″·039
III.		22·0	− 0·005	+ 0·005	X.		26·0	− 0·050	− 0·012
IV.		29·0	− 0·002	+ 0·001	XI.	August	1·0	+ 0·002	+ 0·037
V.	July	6·0	− 0·009	− 0·016	XII.		7·0	− 0·050	+ 0·022
VI.		11·0	+ 0·026	− 0·088	XIII.		13·0	+ 0·006	+ 0·023
VII.		18·0	− 0·066	− 0·045	XIV.		19·0	− 0·025	− 0·038
VIII.		21·5	+ 0·070	− 0·026	XV.		24·0	+ 0·041	− 0·050

This representation must be regarded as sufficiently satisfactory to permit a preliminary discussion of the systematic errors to be made.

Accordingly the values of $\Delta x'$ and $\Delta y'$ were computed for each day, under the heading "Supplementary Corrections to Ephemeris II," and substituted in the whole of the equations. Considering, in the first place, the single distances, an endeavour was made to represent them on various hypotheses.

As a matter of convenience the results were classed in groups according to the observer, and in each class the observations were arranged in order of distance. It then appeared as formerly, that, except in the cases of Dr. Peter and Dr. Hartwig, all the observers require positive corrections to their observations of short distances. In the case of the Cape observations these errors seem to be in great part, if not entirely, due to the method of "crossing through," (*see* Triangulation, pp. 233–237) and for these observations, when the angle ψ is measured and duly allowed for, no further correction appears to be requisite; but it is probable that quantities so large as the systematic errors of short distances measured at Yale and Göttingen depend upon some, as yet, unexplained cause.

In a very interesting paper (*Ast. Nach.* 3179) Dr. Schur gives the results of his observations of various zones of stars, and concludes that his observations require an empiric positive correction which attains its maximum (about 0″·20) for distances of about 1300″, and becomes insensible for distances towards 0″ and 3000″. It is, however, generally unsafe to rely upon determinations of personal error which have been made *after* the observer has become aware of its existence.*

* A noteworthy instance in point occurred in the case of several observers who took part in the meridian observations of the Mars comparison stars in 1877. When the heliometer triangulation showed that nearly all observers recorded transits of bright stars earlier than transits of faint stars, many of the same observers subsequently made determinations of personal error for magnitude. In several cases a marked diminution of the "magnitude-error" was found on the second occasion, simply due to the fact that the knowledge of the existence of such an error had enabled the observer to overcome it in some degree.

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Dr. Schur's habit of observing appears, from the following results, to have changed between the time when he made the observations of *Victoria* in 1889 and that when he made the observations discussed in his paper, "*Untersuchungen über den Verlauf der Systematischen Correctionen bei den Messungen Kleiner Distanzen am Heliometer*" (*Ast. Nach.* 3197). It is also worthy of remark that, for the latter observations, Dr. Schur employed stars considerably brighter than *Victoria* and its comparison stars, and probably observed at much greater altitudes in circumstances of far better definition. He was also careful to limit the angle ψ as much as possible, and he expressly states that he did so.

It seems therefore probable that, with fainter objects in circumstances of less favourable definition, Dr. Schur caused the images to pass and repass through each other by larger angles than he was aware of.

On this point Dr. Elkin writes, under date 1894 April 30, as follows :—

"I have, since last January, in all my parallax measures, and a few others, noted the position-circle readings before and after swinging through, and I find, as was very natural to expect, that my habit is to swing the faint stars through much farther than bright ones.

Up to the present date I have the following values.

Magnitude	6·5 or less	7·0	7·25	7·5	8·0	8·25	8·5
	″	″	″	″	″	″	″
	10	10	14	16	24	22	21
	8	15	14	17	22	...	23
	...	12	13	15	20	...	23
	...	13	13	8	25	...	20
	...	15	14	15	13	...	...
	...	12	13	14	19	...	...
	...	14	...	17	13	..	...
	...	...	...	14	15	...	...
	...	...	...	13	21	...	...
	...	...	...	...	15	...	...
	...	...	...	...	16	...	...
Mean value of κ ...	9	13	13	14	18	22	22

In these observations I have tried to let myself not be in any way influenced by my knowing I ought not to swing through far, but have made the observations just as I think I always have. There is therefore no doubt but that I did swing through from 20″ to 25″ for the *Victoria* work, and you will notice in the above numbers that as soon as the stars become in any way faint the amount of swinging through is very variable, and hence the large variations in the residuals you deduce for me. The definition will, of course, have some effect, but I have not found much in the values as yet. I find also that the swinging through will depend on which handle for the position-circle motion I use—I have only two handles, as you know—and when I commence to use the fine one I have to give several turns to get the stars well separated, therefore I probably separate the images less in the measures of the larger distances. For distances up to about 2500″ I use the coarser motion handle; and it is not unlikely that for very small distances (where several turns of the handle would be requisite to separate the images 20″) I may also separate the images less."

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The question of the best method of expressing the corrections applicable to the single distances, and, in a smaller degree, to the double distances also, required, therefore, very careful discussion.

If the range of distance were sufficiently great to give determinate values of three constants, the best expression for the systematic errors of the distances would probably be—

$$\Delta s = n\left(\frac{s}{1000}\right) + \mathrm{N}\left(\frac{1000}{s}\right) + \mathrm{N}'\left(\frac{1000}{s}\right)^2$$

The term n would then represent a very small term depending on the observer's personal error in pointing on the Standard Stars. The discussion of the Triangulation (p. 147) seemed to prove the existence of such an error.

The term N expresses the correction due to a constant value of κ in "crossing through"; N should be positive if the observer takes advantage of the square formed by the wires in the field of view as a guide to direction; or, if the observer uses a dark field and refers his method of crossing through to an imaginary line in which the images of the stars interchange places, N may be negative.

The term N′ expresses a possible tendency on the part of the observer to diminish the amount of "crossing through" as the distance diminishes; for not only is the large amount of rotation required for small distances more troublesome, but the careful observer instinctively notes that, in small distances, the path of the star in "crossing through" is not a straight line, and therefore he may limit the value of κ more than in greater distances. The term N′ should therefore come out with the opposite sign to that of N.

For errors having any unexplained origin the expression seems sufficiently general as a method of interpolation. But if we attempt to deduce the whole of these three terms from distances which range only from 300″ or 400″ to 1200″ or 1300″, the values of n, N and N′ are obtained with such insignificant weights as to show that the true constants are practically indeterminate from such data. Thus, employing three terms, we get by the method of least squares, and having regard to the weights, the values of the constants which are given in the Table on p. 459.

The representation of the uncorrected single distances is given under column I., and is very satisfactory, but the insignificant weights of the constants show their indeterminate character. One of the constants must therefore be dropped, and the question arises whether the term n or N′ should be omitted. The true constant n is known to be very small for all the observers, for we have in the Triangulation,

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p. 231, the following corrections for distances of 6000″ and 7000″, which, as shown (Triangulation, p. 147) represent the systematic errors of different observers in measuring the Standard Stars—

Distance.	Gill.	Finlay.	Chase.	Schur.
6000″	— 0″·04	— 0″·13	— 0″·18	— 0″·12
7000	0·00	— 0·12	— 0·08	— 0·07

For distances of 1000″, therefore, the correction depending on the term n would not amount to more than − 0″·02.

Neglecting the term n, but retaining the terms N and N′, a second expression was found for the systematic corrections, the representation of which is given under column II.

Finally, a third solution was made, retaining only the term N ; the representation of this solution is given under column III.

In determining the values of the constants of n, N and N′ the weight of each equation was that employed in the reduction of Ephemeris I.

For System I., only the single equations were considered ; for Systems II. and III. the equations from the double distances were included, but it will be seen from the following normals that although (on account of the small co-efficients of N) their influence on the result is very small, yet the normals from the double distances all agree in giving N with the same sign, and (far within limits of the probable error of the determination) the same value of N as those from the single distances.

From the Double Distances.

	Normals in N	Normals in N′
Auwers	2·098 A + 0·915 A′ = + 0″·212	0·915 A + 0·521 A′ = — 0″·015
Gill	2·500 G + 0·914 G′ = + 0·110	0·914 G + 0·368 G′ = + 0·070
Elkin	0·782 E + 0·240 E′ = + 0·484	0·240 E + 0·079 E′ = + 0·140
Hall	0·116 H + 0·035 H′ = + 0·027	0·035 H + 0·011 H′ = + 0·003
Peter	2·104 P + 0·680 P′ = — 0·619	0·680 P + 0·241 P′ = — 0·155
Schur	0·482 S + 0·173 S′ = + 0·135	0·173 S + 0·073 S′ = + 0·081

From the Single Distances.

Auwers	149·15 A + 270·12 A′ = + 13″·008	270·12 A + 540·60 A′ = + 23·357
Gill	98·41 G + 157·62 G′ = + 9·431	157·62 G + 264·53 G′ = + 14·848
Elkin	39·19 E + 77·02 E′ = + 13·268	77·02 E + 164·39 E′ = + 24·959
Hall	21·69 H + 45·09 H′ = + 4·680	45·09 H + 97·24 H′ = + 9·508
Peter	28·56 P + 43·96 P′ = + 0·307	43·96 P + 70·43 P′ = + 1·122
Schur	13·47 S + 21·42 S′ = + 5·538	21·42 S + 35·65 S′ = + 9·021

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The solution of the normals gives the values of n, N and N′ shown in the following Table :—

Observer.	System I.			System II.		System III.
	n	N	N′	N	N′	N
	″	″	″	″	″	″
Auwers	− 0·055	+ 0·1563	− 0·0256	+ 0·0986	− 0·0063	+ 0·0874
Gill	+ 0·314	− 0·2919	+ 0·1535	+ 0·1016	− 0·0045	+ 0·0946
Elkin	+ 0·063	+ 0·4371	− 0·0613	+ 0·2613	+ 0·0299	+ 0·3190
Hall	+ 0·668	− 0·6090	+ 0·3120	+ 0·3383	− 0·0592	+ 0·2518
Peter	0·000	− 0·3491	+ 0·2337	− 0·3741	+ 0·2500	− 0·0102
Schur	+ 0·070	+ 0·0901	+ 0·1806	+ 0·1892	+ 0·1400	+ 0·4066

The single distances are then represented as follows :—

Group and Set.	Comparison Star.	$\frac{s}{1000}$ Distance.	O–C uncorrected.	Representation of O–C, corrected according to Systems I.	II.	III.	Weight.
Auwers.							
			″	″	″	″	
X_3	p	0·35	−0·232	−0·014	−0·002	+0·018	3·54
XV_5	d	0·51	− ·127	+ ·053	+ ·042	+ ·044	2·61
XV_3	d	0·52	− ·055	+ ·122	+ ·111	+ ·113	2·61
X_2	p	0·53	− ·205	− ·030	− ·041	− ·040	4·30
VIII_5	q	0·56	− ·188	− ·021	− ·032	− ·032	2·61
XV_2	d	0·62	− ·119	+ ·032	+ ·024	+ ·022	4·30
XIII_7	e	0·63	− ·171	− ·022	− ·030	− ·032	2·61
XII_3	f	0·64	− ·271	− ·125	− ·132	− ·135	4·30
VII_4	t	0·64	− ·144	+ ·002	− ·005	− ·008	2·61
XI_4	m	0·69	− ·127	+ ·008	+ ·003	± ·000	2·61
XII_1	g	0·72	− ·204	− ·076	− ·079	− ·083	3·54
VI_1	x	0·81	− ·064	+ ·045	+ ·047	+ ·044	5·88
XV_7	d	0·82	+ ·072	+ ·180	+ ·183	+ ·179	4·40
XIV_5	d	0·95	− ·189	− ·105	− ·092	− ·097	5·20
III_6	θ	0·97	− ·233	− ·152	− ·138	− ·143	1·92
X_6	p	1·04	− ·043	+ ·026	+ ·046	+ ·041	3·31
VIII_1	q	1·18	− ·015	+ ·035	+ ·064	+ ·059	5·20
Gill.							
			″	″	″	″	
X_4	p	0·45	−0·211	+0·036	−0·007	−0·001	1·95
XV_4	d	0·51	− ·303	− ·127	− ·120	− ·118	3·25
VIII_3	q	0·55	− ·109	+ ·039	+ ·062	+ ·063	4·49
XIII_6	e	0·56	− ·107	+ ·036	+ ·061	+ ·062	2·74
Gill—*continued*.							
			″	″	″	″	
XV_1	d	0·64	−0·087	+0·030	+0·061	+0·061	2·74
X_1	p	0·67	− ·098	+ ·017	+ ·043	+ ·043	2·74
III_5	θ	0·73	− ·153	− ·036	− ·021	− ·023	2·74
XIII_4	e	0·75	− ·047	+ ·072	+ ·081	+ ·079	3·36
XV_6	d	0·77	− ·073	+ ·048	+ ·052	+ ·050	2·74
V_4	z	0·79	+ ·031	+ ·154	+ ·153	+ ·151	2·74
XII_2	f	0·79	− ·026	− ·083	− ·084	− ·086	4·49
X_5	p	0·84	− ·288	− ·154	− ·173	− ·175	2·74
VII_5	t	0·89	− ·182	− ·139	− ·074	− ·076	2·74
VIII_2	q	0·95	− ·173	− ·014	− ·071	− ·074	2·74
III_1	λ	1·06	− ·131	+ ·063	− ·039	+ ·042	2·19
Elkin.							
			″	″	″	″	
XII_{13}	f	0·34	−0·274	+0·502	+0·751	+0·664	0·39
VIII_9	q	0·39	− ·761	− ·019	+ ·103	+ ·056	1·38
X_8	p	0·45	− ·988	− ·292	− ·262	− ·280	1·07
VII_9	v	0·51	− ·819	− ·165	− ·192	− ·194	1·07
XV_8	d	0·58	− ·815	− ·207	− ·277	− ·266	0·39
III_{11}	θ	0·59	− ·866	− ·265	− ·339	− ·327	0·75
XIII_{14}	e	0·63	− ·625	− ·045	− ·134	− ·119	0·39
XIII_{15}	e	0·68	− ·144	+ ·409	+ ·305	+ ·325	0·75
XII_{10}	g	0·69	− ·285	+ ·264	+ ·156	+ ·178	1·38

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Group and Set.	Comparison Star.	$\frac{x}{1000}$ Distance.	O–C uncorrected.	Representation of O–C, corrected according to Systems I.	II.	III.	Weight.
ELKIN—*continued.*							
			″	″	″	″	
V_{16}	w	0·71	—0·307	+0·232	+0·121	+0·143	1·07
VIII_{10}	q	0·72	— ·703	— ·169	— ·282	— ·260	1·38
VII_{14}	t	0·89	— ·351	+ ·117	— ·022	+ ·006	1·38
V_{14}	z	0·93	— ·745	— ·285	— ·428	— ·400	1·07
VIII_7	q	0·94	+ ·123	+ ·576	+ ·433	+ ·461	0·57
III_7	λ	1·31	— ·671	— ·292	— ·456	— ·429	0·75
HALL.							
			″	″	″	″	
VIII_8	q	0·41	—0·443	+0·201	+0·030	+0·172	1·12
VII_9	v	0·44	— ·706	— ·188	— ·244	— ·134	1·12
X_7	p	0·52	— ·277	+ ·052	+ ·154	+ ·207	1·35
III_{12}	θ	0·55	+ ·009	+ ·301	+ ·428	+ ·468	0·31
V_{10}	z	0·55	— ·246	+ ·046	+ ·173	+ ·213	0·31
V_{13}	z	0·86	— ·498	— ·209	— ·186	— ·206	0·86
VII_{15}	t	1·00	— ·119	+ ·252	+ ·160	+ ·133	0·73
III_8	λ	1·34	— ·662	— ·029	— ·441	— ·473	0·45
HARTWIG.							
			″				
VIII_{12}	q	0·66	—0·173	Systematic Corrections assumed Zero.			0·39
XI_{17}	m	0·68	+ ·168				0·39
VII_{17}	t	0·83	— ·227				0·20
VIII_{11}	q	0·99	+ ·107				0·39

Group and Set.	Comparison Star.	$\frac{x}{1000}$ Distance.	O–C uncorrected.	Representation of O–C, corrected according to Systems I.	II.	III.	Weight.
PETER.							
			″	″	″	″	
III_{16}	θ	0·48	—0·337	—0·050	—0·032	—0·358	1·08
XV_9	d	0·62	+ ·044	+ ·088	+ ·090	+ ·028	1·49
XIII_{11}	e	0·62	+ ·017	+ ·061	+ ·063	+ ·001	2·14
XIII_{10}	e	0·67	— ·022	— ·022	— ·024	— ·037	2·14
V_8	z	0·71	— ·331	— ·357	— ·360	— ·345	1·08
XI_{10}	m	0·71	+ ·159	+ ·133	+ ·130	+ ·145	1·49
III_{17}	θ	0·86	+ ·108	+ ·019	+ ·012	+ ·096	1·83
XIV_{10}	d	0·96	+ ·125	+ ·015	+ ·007	+ ·114	1·08
III_{13}	λ	1·24	+ ·059	— ·069	— ·079	+ ·051	1·08
XIII_8	e	1·36	+ ·241	+ ·111	+ ·102	+ ·233	0·59
SCHUR.							
			″	″	″	″	
III_{20}	θ	0·47	—1·137	+0·009	—0·098	—0·270	0·69
XV_{10}	d	0·61	—0·571	+ ·107	+ ·116	+ ·096	0·35
XV_{11}	d	0·62	— ·031	+ ·627	+ ·636	+ ·624	0·35
XIII_{18}	e	0·63	— ·700	— ·054	— ·045	— ·053	0·69
XII_{15}	f	0·66	— ·550	+ ·094	+ ·102	+ ·111	0·35
XI_{15}	m	0·69	— ·575	— ·015	— ·007	+ ·015	0·69
XII_{14}	g	0·71	— ·595	— ·057	— ·050	— ·021	0·69
VI_8	x	0·74	— ·740	— ·236	— ·230	— ·191	0·69
III_{21}	θ	0·84	— ·247	+ ·178	+ ·177	+ ·237	0·69
XIV_{16}	d	0·96	— ·585	— ·226	— ·238	— ·162	0·69
XIII_{17}	f	1·43	— ·112	+ ·144	+ ·089	+ ·173	0·35

The single distances, where the angle ψ has been observed and the corresponding corrections applied, are represented as follows without any correction—

AUWERS.							
			″				
VII_3†	t	0·15	—0·011				
XII_7	f	0·30	+ ·202				3·70
XII_4*	f	0·34	— ·070				4·30
VIII_4	q	0·42	— ·265				2·61
GILL.							
			″				
VII_2†	t	0·13	—0·101				2·74
XII_6	f	0·16	+ ·244				1·55
XII_5	f	0·21	— ·143				2·74
XIII_5	e	0·24	+ ·144				2·74

* To equation XII_4 is applied the further correction + 1·47 A_1—*See* foot-note attached to the original Table, p. 407, and Vol. II. p. 75.

† Components of artificial double star placed at right-angles to line joining the other images, thus no correction required. (*See* Triangulation, p. 237.)

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A glance at these residuals is sufficient to show that, except for Dr. Peter, the observations are practically represented as well by Solution III. as by the more elaborate Solutions I. and II. Indeed, Solution I. becomes merely a form of interpolation, its constants are determined with such small weight as to have no reality, and the corrections are quite inapplicable for distances greater or less than those over which the single distances extend. The reality of the term depending on the reciprocal of the distance is additionally proved by its applicability to the double distances. The reality of the term depending on the square of the reciprocal of the distance, though it rests *a priori* on a reasonable basis of probable fact (*see* especially Dr. Elkin's notes, p. 456) is rendered extremely uncertain by the small weight with which it is determined. The best test whether System II. or III. should be adopted will be found in the probable error of the resulting Solar Parallax found by both methods. Accordingly the absolute terms of the final equations were formed both according to System II. and System III.

A discussion of these residuals (which may be regarded as nearly definitive) showed that the previous weights of the single distances should be multiplied by the following Factors.

TABLE OF FACTORS BY WHICH THE PREVIOUSLY ADOPTED WEIGHTS OF THE SINGLE DISTANCES SHOULD BE MULTIPLIED.

Auwers.....	1·44	Peter	1·25
Gill	1·59	Schur.....	1·35
Elkin.....	0·43	Hartwig	3·80
Hall	0·87		

The work having reached this stage, I was on the point of forming the normal equations from the single distances when I was struck by the marked tendency in Dr. Peter's observations of double distances to give positive residuals in the sense (O–C) (*see* p. 463). At first one was disposed to attach little significance to this circumstance, because these residuals may be either positive or negative according as the equation is referred to one or other of the two comparison stars. But, as a matter of system, the equations from the double distances have, in tabulation, been referred to the preceding star (that is to say the factors of x' are all positive) and this being the case there must be something systematic in the Leipzig observations tending to give a positive value of x'. An examination of the matter showed that no peculiarity in the observer's habit of bisecting bright as compared with fainter stars could create such an error, because the arrangement of the brighter and fainter stars is quite symmetrical throughout. Neither could the error be due to dissymmetry in the distances, as the observations have been already discussed on that hypothesis.

There remained then for consideration only one question, viz., has the arrangement of the tabulation of the double distances any connection with the direction of the

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planet's motion ? On computing $\frac{ds}{dt}$ for each observation of Dr. Peter's double distances, it turned out that, excepting in one instance, the motion of the planet tended to diminish its distance from the preceding star. This being the case, it is not difficult to imagine a *vera causa* for systematic error.

Most astronomers are familiar with the form of personality which is frequently found in the meridian observation of very close circumpolar stars by different observers. The star's very slow motion in Right Ascension is always accompanied by a certain amount of vibration due to atmospheric causes. One observer notes the instant as soon as he is sure that he has seen the star bisected by the wire, a second observer is perhaps disposed to wait till he has noted the vibration of the star's image as often towards one side of the wire as the other, whilst the excessive caution of a third observer causes him to be still later in noting the instant of bisection.

An extreme illustration of the case in point is given by Mr. Stone (*Cape Observations* 1871-73, p. ix). This correction is to be clearly distinguished from the ordinary personal equation which holds good for stars whose passage behind the spider web is a more or less sudden phenomenon; in the latter case the observer's time of nerve-transmission plays a sensible part, and the indecision of the observer (caused by the undulations of the image) in great part disappears.

The results quoted by Mr. Stone (*loc. cit*) show that for very slow moving circumpolars the systematic errors may amount to the following quantities in time (they are the equivalents of the systematic errors of Azimuth quoted by Mr. Stone) :—

B Octantis	13·6	seconds of	time.
σ Octantis	10·0	,,	,,
ο Octantis	7·4	,,	,,

This, however, is only an extreme instance illustrating the kind of systematic error, expressed in time, that may arise in the observation of gradually developing phenomena. The case of Heliometer observations of Minor Planets is somewhat analagous, although the conditions of observation are quite different. In the case of meridian observations of B Octantis the motion in arc on the great circle is 0″·15 in a second of time, whilst in the case of *Victoria* the maximum motion of the planet relative to a comparison star does not amount to 0″·01 in the same unit of time. This latter motion is too slow to be employed by the observer as a means of completing his bisection, and besides, to make sure of an accurate "pointing," the observer should cause the images to cross and recross through each other by alternate opposite motions of the position-handle.

One observer may be chiefly inspired by the idea that, the planet being a moving object, he must take excessive care not to note his time too late, and accordingly, so soon as the images first appear to him to cross each other symmetrically he records the

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time ; a second observer may be more careful to wait until he is quite sure, after repeated reversions of the position-handle, that the two images, agitated as they always are by atmospheric disturbance, cross each other on the whole symmetrically ; whilst a third observer may fall into a habit of more prolonged indecision.

The personal error in such observations therefore represents the time required by the observer, after making a pointing, to be sure that his original intention has been satisfied.

If we denote this personality for the observers Auwers, Gill, Elkin, &c., by a, g, e, &c., and assume that the only systematic outstanding errors of the residuals are due to this cause, the value of the personal constant would be determined from the double distances by equations of the type

$$\frac{ds}{dt} n = (\text{C–O})$$

For the single distances (as the values of A, G, E, &c., may be affected by the term depending on $\frac{ds}{dt}$) the equations have the type

$$\frac{1000}{s}\text{N} + \frac{ds}{dt} n = \text{C–O}.$$

If $\frac{ds}{dt}$ denote the change of distance (expressed in seconds of arc) in $\frac{1}{1000}$ part of a day, Dr. Peter's observations give the following equations :—

PETER.

Double Distances.			Single Distances.		
Set.	C–O	Weight.	Set.	C–O	Weight.
II_4	$-0{\cdot}62\,p = -0{\cdot}057$	1·97	III_{16}	$2{\cdot}08\,P + 0{\cdot}15\,p = +0{\cdot}337$	1·08
II_5	$-{\cdot}61\,p = -{\cdot}053$	3·33	XV_{19}	$1{\cdot}61\,P + {\cdot}17\,p = -{\cdot}044$	1·49
III_{14}	$-{\cdot}58\,p = -{\cdot}281$	1·07	XIII_{11}	$1{\cdot}61\,P + {\cdot}27\,p = -{\cdot}017$	2·14
III_{15}	$-{\cdot}59\,p = -{\cdot}147$	3·33	XIII_{10}	$1{\cdot}49\,P - {\cdot}34\,p = +{\cdot}022$	2·14
IV_{15}	$-{\cdot}65\,p = -{\cdot}146$	3·33	V_8	$1{\cdot}41\,P + {\cdot}79\,p = +{\cdot}331$	1·08
IV_{16}	$-{\cdot}65\,p = -{\cdot}251$	1·97	XI_{10}	$1{\cdot}41\,P - {\cdot}24\,p = -{\cdot}159$	1·49
IV_{17}	$-{\cdot}63\,p = -{\cdot}099$	1·07	III_{17}	$1{\cdot}16\,P + {\cdot}55\,p = -{\cdot}108$	1·83
IV_{18}	$-{\cdot}70\,p = -{\cdot}009$	3·33	XIV_{10}	$1{\cdot}04\,P - {\cdot}16\,p = -{\cdot}125$	1·08
VI_3	$-{\cdot}60\,p = -{\cdot}013$	1·97	III_{13}	$0{\cdot}81\,P + {\cdot}36\,p = -{\cdot}059$	1·08
VI_4	$-{\cdot}54\,p = -{\cdot}163$	1·07	XIII_8	$0{\cdot}74\,P - {\cdot}37\,p = -{\cdot}241$	0·59
IX_5	$-{\cdot}71\,p = +{\cdot}257$	1·07			
XI_8	$-{\cdot}18\,p = +{\cdot}010$	1·97			
XI_9	$-{\cdot}53\,p = -{\cdot}294$	3·33			
XI_{11}	$-{\cdot}28\,p = -{\cdot}076$	1·97			
XIII_9	$-{\cdot}38\,p = -{\cdot}095$	1·97			
XIV_7	$-{\cdot}26\,p = +{\cdot}074$	1·97			
XIV_8	$+{\cdot}18\,p = -{\cdot}050$	1·97			
XIV_9	$-{\cdot}22\,p = +{\cdot}030$	3·33			

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From these equations we get, by the method of least squares, and having regard to the weights, the normal equations :—

	Normal in P.	Normal in p.
From the Single Distances.....	$28{\cdot}56\ P + 2{\cdot}43\ p = +\ 0^{s}{\cdot}306$	$2{\cdot}43\ P + 2{\cdot}02\ p = +\ 0^{s}{\cdot}301$
From the Double Distances.....	... ...	... $11{\cdot}08\ p = +\ 1^{s}{\cdot}813$

whence

From the Double Distances..... $p = +\ 0{\cdot}16$ weight 11·08

From the Single Distances..... $p = +\ 0{\cdot}15$ weight 1·85

Thus it appears that Dr. Peter seems to have quickly satisfied himself that the images seemed to coincide in crossing through, and on the average he did so earlier than the mean observer by 0·00016 of a day, or by nearly 14 seconds of time.

Similarly the corresponding normal equations for the various observers are found to be :—

AUWERS.

Normal Equations.	*Resulting Values.*
$149{\cdot}36\ A - 5{\cdot}92\ a = +\ 13{\cdot}013$	$a = -\ 0{\cdot}045$ weight 35·67
$-\ 5{\cdot}92\ A + 35{\cdot}90\ a = -\ 2{\cdot}119$	$A = +\ 0{\cdot}085$
	Former value $= +\ {\cdot}087$
	$\Delta A = -\ 0{\cdot}002$ weight 148·38

GILL.

$98{\cdot}41\ G - 9{\cdot}89\ g = +\ 9{\cdot}429$	$g = -\ 0{\cdot}023$ weight 32·38
$-\ 9{\cdot}89\ G + 33{\cdot}37\ g = -\ 0{\cdot}214$	$G = +\ 0{\cdot}098$
	Former value $= +\ {\cdot}095$
	$\Delta G = +\ 0{\cdot}003$ weight 95·48

ELKIN.

$39{\cdot}23\ E + 3{\cdot}91\ e = +\ 13{\cdot}274$	$e = +\ 0{\cdot}073$ weight 8·82
$3{\cdot}91\ E + 9{\cdot}21\ e = +\ 1{\cdot}966$	$E = +\ 0{\cdot}331$
	Former value $= +\ {\cdot}319$
	$\Delta E = +\ 0{\cdot}012$ weight 37·57

HALL.

$27{\cdot}71\ H + 0{\cdot}33\ h = +\ 4{\cdot}679$	$h = +\ 0{\cdot}097$ weight 3·11
$0{\cdot}33\ H + 3{\cdot}11\ h = +\ 0{\cdot}358$	$H = +\ 0{\cdot}168$
	Former value $= +\ {\cdot}252$
	$\Delta H = -\ 0{\cdot}084$ weight 27·68

PETER.

$28{\cdot}56\ P + 2{\cdot}43\ p = +\ 0{\cdot}306$	$p = +\ 0{\cdot}162$ weight 12·89
$2{\cdot}43\ P + 13{\cdot}10\ p = +\ 2{\cdot}114$	$P = -\ 0{\cdot}003$
	Former value $= -\ {\cdot}010$
	$\Delta P = +\ 0{\cdot}007$ weight 28·11

SCHUR.

$13{\cdot}47\ S + 0{\cdot}94\ s = +\ 5{\cdot}538$	$s = -\ 0{\cdot}015$ weight 3·23
$0{\cdot}94\ S + 3{\cdot}30\ s = +\ 0{\cdot}339$	$S = +\ 0{\cdot}412$
	Former value $= +\ {\cdot}407$
	$\Delta S = +\ 0{\cdot}005$ weight 13·20

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Similarly for the Position-Angles we denote the systematic time-constant for Auwers, Gill, Elkin, &c. by a', g', e', &c., and the co-efficient in each equation is—

$$s \sin 1'' \frac{dp}{dt}$$

The resulting normals similarly obtained are—

				Weight.
Auwers	$18{\cdot}86\ a'$	$= -0{\cdot}814$	$a' = -0{\cdot}043$	18·86
Gill	$11{\cdot}70\ g'$	$= +0{\cdot}268$	$g' = +0{\cdot}023$	11·70
Elkin	$5{\cdot}36\ e'$	$= +0{\cdot}463$	$e' = +0{\cdot}087$	5·36
Hall	$1{\cdot}25\ h'$	$= -0{\cdot}188$	$h' = -0{\cdot}150$	1·25
Peter	$2{\cdot}92\ p'$	$= -0{\cdot}047$	$p' = -0{\cdot}016$	2·92
Schur	$1{\cdot}09\ s'$	$= +0{\cdot}036$	$s' = +0{\cdot}033$	1·09

Instead of substituting the numerical values of the constants in the equations of condition in which they occur, it is safer to find the values of the unknowns in terms of these constants, and to discuss the effect of the introduction of the smaller personal terms at the close of the work. The co-efficients $\frac{ds}{dt}$ and $s \sin 1'' \frac{dp}{dt}$ have accordingly been computed for each set of observations, and entered with the symbol of their corresponding constants beside the absolute term on the right hand side of the equation. The equations of condition from the distances thus assume the form

$$f' \Delta x' + f'' \Delta y' + f''' z = (\text{O–C}) + \frac{ds}{dt} n + \frac{1000}{s} \Delta \text{N}$$

where for ΔN will be written ΔA, or ΔG, or ΔE, &c., according to the observer, and similarly for n will be written a, or g, or e, &c. The factors of these constants ΔA, ΔG, ΔE, &c., are identical with the corresponding factors of A, G, E, &c.

The normals were formed and solved with the absolute terms both of columns I. and II.

For the position-angles the equations have the form

$$f_p' \Delta x' + f_p'' \Delta y' + f_p''' z = \text{O–C} + \left(s \sin 1'' \frac{dp}{dt}\right) n'$$

where for n' was written a', or g', or e', &c., according to the observer.

From equations formed after these types, normal equations were computed, having regard to the weights (viz., those of the previous solution multiplied by the factors given at pp. 454 and 461).

System A employing all observations.
" B " " " except single distances.
" C " the Cape observations only.

Values of z were then found from these normals in terms of

ΔA, ΔG, ΔE, &c., a, g, e, &c., a', g', e', &c.

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There resulted—

From System A.	II.	uncorrected for personal terms					$z = +0{\cdot}0103$;	$\frac{[p\,vv]}{n-1}$	$= 0{\cdot}0461$
"	"	B.	II.	"	"	"	"	$= +0{\cdot}0072$;	"	$= 0{\cdot}0443$
"	"	C.	II.*	"	"	"	"	$= +0{\cdot}0061$;	"	$= 0{\cdot}0365$
"	"	A.	III.	"	"	"	"	$= +0{\cdot}0055$;	"	$= 0{\cdot}0469$
"	"	B.	III.	"	"	"	"	$= +0{\cdot}0030$;	"	$= 0{\cdot}0446$
"	"	C.	III.*	"	"	"	"	$= +0{\cdot}0062$;	"	$= 0{\cdot}0362$

or, after substitution of the values ΔA, ΔG, &c., a, g, &c., a', g', &c., (pp. 464, 465)—

From System A.	II.	corrected for personal terms					$z = +0{\cdot}0058$;	$\frac{[p\,vv]}{n-1}$	$= 0{\cdot}0402$
"	"	B.	II.	"	"	"	"	$= -0{\cdot}0017$;	"	$= 0{\cdot}0339$
"	"	C.	II.*	"	"	"	"	$= +0{\cdot}0070$;	"	$= 0{\cdot}0411$
"	"	A.	III.	"	"	"	"	$= +0{\cdot}0009$;	"	$= 0{\cdot}0338$
"	"	B.	III.	"	"	"	"	$= -0{\cdot}0059$;	"	$= 0{\cdot}0294$
"	"	C.	III.*	"	"	"	"	$= +0{\cdot}0072$;	"	$= 0{\cdot}0409$

The considerably smaller values of $\frac{[p\,vv]}{n-1}$ given by the corrected values of z afford further evidence of the general reality of the corrections depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$.

For the same reason System III. is preferable to System II. ;—that is to say, the term depending on the square of the reciprocal of the distance does not appear to be real. This would tend to show that the value of κ in "crossing through" is more dependent on accidental circumstances than upon the distance.

The value of the parallax was therefore derived from System III., corrected for the effect of the small personal terms.

We have then the following results for the Mean Solar Parallax—

System A. (All observations combined.)

$$z = +0{\cdot}0009 \text{ ; weight } 369{\cdot}5 \text{ ; } \frac{[p\,vv]}{n-1} = 0{\cdot}0338$$

whence the *mean error* of one observation of weight *unity* is

$$\pm\, 0''{\cdot}1838$$

and the *mean error* of z is

$$\pm\, 0''{\cdot}0096$$

and

$$\pi = 8''{\cdot}80 + (0''{\cdot}0009 \times 0{\cdot}88) = 8''{\cdot}8008$$

with *probable error*

$$= \pm\, 0{\cdot}0096 \times 0{\cdot}88 \times 0{\cdot}6745 = \pm\, 0''{\cdot}0057.$$

* Groups I., II., V., VI. and XIV. give no determination of the Parallax by the diurnal method.

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System B. (All observations except single distances.)

$$z = -0{\cdot}0059\ ;\ \text{weight } 271{\cdot}9\ ;\ \frac{[p\,vv]}{n-1} = 0{\cdot}02945$$

whence the *mean error* of one observation of weight *unity* is

$$\pm\ 0''{\cdot}1716$$

and the *mean error* of z is

$$\pm\ 0''{\cdot}0104$$

and

$$\pi = 8''{\cdot}80 - (0''{\cdot}0059 \times 0{\cdot}88) = 8''{\cdot}7948$$

with *probable error*

$$= \pm\ 0{\cdot}0104 \times 0{\cdot}88 \times 0{\cdot}6745 = \pm\ 0''{\cdot}0062.$$

System C. (Cape observations only.)

$$z = -0{\cdot}0072\ ;\ \text{weight } 108{\cdot}6\ ;\ \frac{[p\,vv]}{n-1} = 0{\cdot}0409$$

whence the *mean error* of one observation of weight *unity* is

$$\pm\ 0''{\cdot}2022$$

and the *mean error* of z is

$$\pm\ 0''{\cdot}0194$$

and

$$\pi = 8''{\cdot}80 + (0{\cdot}''0072 \times 0{\cdot}88) = 8''{\cdot}8063$$

with *probable error*

$$= \pm\ 0{\cdot}0194 \times 0{\cdot}88 \times 0{\cdot}6745 = \pm\ 0''{\cdot}0115.$$

From the normals the values of $\Delta x'$ and $\Delta y'$ were determined (according to Solution III.) with the following results :—

Group.	Mean Epoch B.M.T. 1889.	Values of $\Delta x'$						Values of $\Delta y'$					
		System A.		System B.		System C.		System A.		System B.		System C.	
		Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.
	d	″	″	″	″	″	″	″	″	″	″	″	″
II.	June 17·0	+0·016	0·000	+0·016	0·000	+0·043	+0·052	+0·057	+0·076	+0·057	+0·076	+0·060	+0·042
III.	22·0	− ·010	− ·026	− ·014	− ·033	− ·036	− ·020	− ·008	+ ·005	+ ·007	+ ·018	+ ·030	+ ·019
IV.	29·0	·000	− ·023	·000	− ·023	− ·075	− ·055	+ ·001	+ ·002	+ ·001	+ ·002	+ ·018	+ ·005
V.	July 6·0	+ ·089	+ ·093	− ·005	+ ·020	+ ·052	+ ·081	− ·046	− ·047	− ·017	− ·023	− ·032	− ·044
VI.	11·0	+ ·028	+ ·012	− ·022	− ·065	+ ·070	+ ·090	− ·059	− ·056	− ·097	− ·115	− ·031	− ·037
VII.	18·0	− ·010	+ ·009	− ·063	− ·048	− ·014	+ ·010	− ·033	− ·038	− ·044	− ·049	− ·040	− ·046
VIII.	21·5	+ ·053	+ ·069	+ ·071	+ ·081	+ ·052	+ ·078	− ·033	− ·036	+ ·002	+ ·002	− ·047	− ·047
IX.	24·0	+ ·020	+ ·019	+ ·020	+ ·019	+ ·051	+ ·071	+ ·034	+ ·039	+ ·034	+ ·039	+ ·010	+ ·011
X.	26·0	+ ·010	+ ·022	− ·050	− ·039	+ ·008	+ ·032	+ ·001	+ ·003	− ·008	− ·016	+ ·006	+ ·004
XI.	Aug. 1·0	− ·004	·000	− ·005	− ·001	− ·036	− ·023	+ ·040	+ ·041	+ ·035	+ ·037	+ ·029	+ ·033
XII.	7·0	− ·119	− ·108	− ·041	− ·039	− ·147	− ·131	+ ·004	+ ·010	+ ·020	+ ·024	+ ·006	+ ·013
XIII.	13·0	+ ·003	·000	+ ·023	+ ·023	− ·008	·000	+ ·033	+ ·030	+ ·026	+ ·026	+ ·045	+ ·049
XIV.	19·0	− ·008	− ·011	− ·008	− ·011	− ·019	− ·013	− ·046	− ·049	− ·028	− ·033	− ·062	− ·053
XV.	24·0	− ·010	− ·017	+ ·039	+ ·032	− ·005	− ·010	− ·074	− ·071	− ·049	− ·047	− ·081	− ·073

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In the successive processes of computation described in the present chapter, there have been applied to Ephemeris II. two sets of corrections, viz., a "*Preliminary Correction*" (p. 447) and a "*Supplementary Correction*" (p. 454). If to the sum of these two corrections (for the mean epoch of each group) the corresponding values of $\Delta x'$ and $\Delta y'$, taken from the above Table, are added, we obtain for each group the true observed values of the corresponding corrections to Ephemeris II., that is to say, the observed values of x' and y'.

The corrections to the Ephemeris cannot be satisfactorily expressed in terms of the Elements of the Orbit, because the accidental errors of the Solar Tables (whence the data for the Sun's elements were derived) may vary between the crucial dates June 10 and October 28 by an amount larger than the accidental errors of the mean of each group, and the errors of the planetary perturbations may also be quite sensible.

But, apart from the Lunar Perturbation of the Earth, the errors of the tabular place of the planet may be developed in terms of the "Distance from the Earth," and of powers of the time.

Thus we put—

$$x' = \frac{1}{\Delta}\alpha + \frac{t}{10\Delta}\beta + \frac{t^2}{100\Delta}\gamma + \frac{t^3}{10{,}000\Delta}\delta + \frac{t^4}{100{,}000\Delta}\epsilon + l\mu$$

$$y' = \frac{1}{\Delta}\alpha' + \frac{t}{10\Delta}\beta + \frac{t^2}{100\Delta}\gamma + \frac{t^3}{10{,}000\Delta}\delta + \frac{t^4}{100{,}000}\epsilon + l\mu$$

Where Δ is the distance of the planet from the Earth (the mean distance of the Earth from the Sun being = 1); t is the time, reckoned in days, from July 18·0 B.M.T.; α, α', β, β' &c., being constants to be determined; and l is the effect of the Lunar Perturbation of the Earth on the tabular place of the planet, rigorously computed for the mean epoch of the group by the formulæ given at page 441.

The equations thus formed, employing the corrected values of $\Delta x'$ and $\Delta y'$, are given in the following Table.

The weights $P_{x'_A}$, $P_{x'_B}$, $P_{x'_C}$ are the true weights of x' for each group of the Systems A, B and C respectively, and have been computed (having regard to the effects of the errors of the places of the comparison stars on the error of each value of x') in the manner subsequently described. Similarly the weights $P_{y'_A}$, $P_{y'_B}$ and $P_{y'_C}$ are the true weights of the values of y'.

The weight of the value of z from each group was similarly determined.

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Final Equations in x'.

Group.	Co-efficients of						From all observations.	From all observations except single Distances.	From Cape observations only.	Corrected Weights.		
	α	β	γ	δ	ϵ	μ	x'_A	x'_B	x'_C	$P_{x'_A}$	$P_{x'_B}$	$P_{x'_C}$
							"	"	"			
II.	+ 1·08	− 3·36	+10·42	− 3·23	+10·02	+ 2·49	−0·139	−0·139	−0·087	11·6	11·6	9·7
III.	+ 1·12	− 2·91	+ 7·56	− 1·96	+ 5·11	+ 7·28	− ·153	− ·160	− ·147	17·8	14·2	13·7
IV.	+ 1·16	− 2·20	+ 4·18	− 0·80	+ 1·51	+ 0·98	− ·207	− ·207	− ·239	13·5	13·5	11·5
V.	+ 1·19	− 1·42	+ 1·71	− 0·20	+ 0·25	− 7·33	− ·162	− ·235	− ·174	13·7	8·1	9·8
VI.	+ 1·20	− 0·84	+ 0·59	− 0·04	+ 0·03	− 3·10	− ·237	− ·314	− ·159	12·8	8·1	7·2
VII.	+ 1·21	0·00	0·00	0·00	0·00	+ 7·49	− ·204	− ·261	− ·203	22·8	14·2	20·5
VIII.	+ 1·21	+ 0·42	+ 0·15	0·00	0·00	+ 6·93	− ·161	− ·149	− ·152	19·7	10·2	17·1
IX.	+ 1·20	+ 0·72	+ 0·43	+ 0·02	+ 0·01	+ 3·98	− ·235	− ·235	− ·183	20·4	20·4	18·4
X.	+ 1·20	+ 0·96	+ 0·77	+ 0·06	+ 0·05	+ 0·76	− ·257	− ·318	− ·247	17·4	6·5	15·8
XI.	+ 1·18	+ 1·65	+ 2·31	+ 0·32	+ 0·45	− 7·12*	− ·343	− ·344	− ·366	42·2	40·0	37·6
XII.	+ 1·15	+ 2·31	+ 4·62	+ 0·93	+ 1·85	− 3·15	− ·448	− ·379	− ·471	22·4	8·7	19·5
XIII.	+ 1·12	+ 2·92	+ 7·59	+ 1·97	+ 5·13	+ 6·13	− ·303	− ·280	− ·303	23·3	20·0	21·5
XIV.	+ 1·08	+ 3·47	+11·10	+ 3·57	+11·37	+ 4·84	− ·337	− ·337	− ·339	16·8	12·8	13·6
XV.	+ 1·05	+ 3·89	+14·37	+ 5·32	+19·68	− 2·13	− ·394	− ·345	− ·387	13·2	7·0	12·6

Final Equations in y'.

Group.	Co-efficients of						From all observations.	From all observations except single Distances.	From Cape observations only.	Corrected Weights.		
	α'	β'	γ'	δ'	ϵ'	μ	y'_A	y'_B	y'_C	$P_{y'_A}$	$P_{y'_B}$	$P_{y'_C}$
							"	"	"			
II.	+ 1·08	− 3·36	+10·43	− 3·22	+10·00	− 1·22	+0·686	+0·686	+0·652	12·7	12·7	9·5
III.	+ 1·12	− 2·91	+ 7·57	− 1·96	+ 5·09	+ 0·74	+ ·683	+ ·696	+ ·697	19·5	18·0	15·3
IV.	+ 1·16	− 2·20	+ 4·19	− 0·80	+ 1·50	+ 2·20	+ ·755	+ ·755	+ ·758	35·1	35·1	33·2
V.	+ 1·19	− 1·43	+ 1·71	− 0·20	+ 0·25	− 0·37	+ ·743	+ ·767	+ ·746	16·0	15·8	11·9
VI.	+ 1·20	− 0·84	+ 0·59	− 0·04	+ 0·02	− 2·17	+ ·746	+ ·687	+ ·765	13·9	9·8	9·6
VII.	+ 1·21	0·00	0·00	0·00	0·00	+ 0·04	+ ·791	+ ·780	+ ·783	22·7	21·7	19·7
VIII.	+ 1·21	+ 0·42	+ 0·15	0·00	0·00	+ 1·76	+ ·801	+ ·839	+ ·790	14·2	11·0	12·1
IX.	+ 1·20	+ 0·72	+ 0·43	+ 0·02	+ 0·01	+ 2·45	+ ·873	+ ·873	+ ·845	25·1	25·0	24·9
X.	+ 1·20	+ 0·96	+ 0·77	+ 0·06	+ 0·05	+ 2·52	+ ·832	+ ·813	+ ·833	14·3	8·8	13·4
XI.	+ 1·18	+ 1·65	+ 2·31	+ 0·32	+ 0·45	+ 0·36	+ ·831	+ ·827	+ ·823	38·6	36·2	34·3
XII.	+ 1·15	+ 2·31	+ 4·62	+ 0·93	+ 1·85	− 2·08	+ ·742	+ ·756	+ ·745	21·4	16·6	17·6
XIII.	+ 1·12	+ 2·91	+ 7·57	+ 1·98	+ 5·14	− 0·67	+ ·716	+ ·712	+ ·735	24·1	22·4	22·6
XIV.	+ 1·08	+ 3·46	+11·76	+ 3·57	+11·41	+ 1·85	+ ·588	+ ·604	+ ·584	21·9	16·9	16·1
XV.	+ 1·05	+ 3·89	+14·38	+ 5·34	+19·74	+ 1·81	+ ·505	+ ·529	+ ·503	15·4	10·2	14·2

* In consequence of an undetected clerical error this factor appears in the column "Tabular Effect of Lunar Perturbation" (*Monthly Notices*, April 1894, p. 346) as − 1·12, and the computations, of which the results are there given, were made with this erroneous value. The *true* value is − 7·12. The effect of this error, as subsequently shown, is to increase the resulting value of μ by 0·002.

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The original solution of these equations, having regard to their weights, gave the following values of the constants—when the erroneous value of the co-efficient of μ_x (− 1·12) for Group XI. is employed :—

	System A.			System B.			System C.		
	All Terms.	Omitting ε and ε'	Omitting $\varepsilon, \varepsilon', \delta, \delta'$	All Terms.	Omitting ε and ε'	Omitting $\varepsilon, \varepsilon', \delta, \delta'$	All Terms.	Omitting ε and ε'	Omitting $\varepsilon, \varepsilon', \delta, \delta'$
α	−0·18947	−0·19466	−0·20537	−0·22325	−0·22817	−0·22960	−0·18144	−0·19345	−0·20597
β	− ·05159	− ·05703	− ·03410	− ·02835	− ·03155	− ·02611	− ·04536	− ·05966	− ·03684
γ	− ·01476	− ·00846	− ·00488	− ·00742	− ·00210	− ·00119	− ·02383	− ·00809	− ·00434
δ	+ ·02381	+ ·03314	...	+ ·00226	+ ·00785	...	+ ·00838	+ ·03251	...
ε	+ ·00671	...	...	+ ·00546	...	...	+ ·01675	...	...
α'	+0·66503	+0·66691	+0·68500	+0·66527	+0·66752	+0·68177	+0·65584	+0·66717	+0·68419
β'	+ ·03510	+ ·03630	+ ·00112	+ ·03040	+ ·03128	+ ·00074	+ ·02331	+ ·03029	+ ·00129
γ'	− ·00424	− ·00616	− ·01178	− ·00292	− ·00498	− ·00929	+ ·00510	− ·00644	− ·01165
δ'	− ·04877	− ·05120	...	− ·04285	− ·04482	...	− ·02806	− ·04314	...
ε'	− ·00200	...	...	− ·00211	...	...	− ·01219	...	...
μ	+0·00868	+0·00887	+0·00722	+0·00898	+0·00899	+0·00771	+0·00957	+0·00978	+0·00847

When these values are substituted in the original equations the following residuals (in the sense O–C) are obtained :—

RESIDUALS OF x'.

O–C.

Group.	System A. (All observations combined.)			System B. (All except single Distances.)			System C. (Cape observations only.)		
	All Terms.	Omitting ε	Omitting ε and δ	All Terms.	Omitting ε	Omitting ε and δ	All Terms.	Omitting ε	Omitting ε and δ
	″	″	″	″	″	″	″	″	″
II.	+ 0·034	+ 0·052	+ 0·001	+ 0·015	+ 0·026	+ 0·014	+ 0·041	+ 0·086	+ 0·036
III.	− ·030	− ·036	− ·038	− ·025	− ·030	− ·026	− ·034	− ·050	− ·052
IV.	− ·038	− ·053	− ·030	+ ·006	− ·005	− ·001	− ·056	− ·096	− ·071
V.	+ ·082	+ ·074	+ ·095	+ ·068	+ ·063	+ ·059	+ ·085	+ ·063	+ ·088
VI.	− ·016	− ·017	+ ·006	− ·038	− ·037	− ·036	+ ·064	+ ·059	+ ·086
VII.	− ·040	− ·035	− ·010	− ·058	− ·052	− ·041	− ·055	− ·042	− ·017
VIII.	+ ·032	+ ·038	+ ·053	+ ·072	+ ·078	+ ·087	+ ·024	+ ·041	+ ·055
IX.	+ ·001	+ ·007	+ ·009	+ ·021	+ ·026	+ ·029	+ ·039	+ ·056	+ ·059
X.	+ ·023	+ ·029	+ ·020	− ·024	− ·020	− ·022	+ ·024	+ ·039	+ ·032
XI.	− ·001	·000	− ·025	− ·010	− ·010	− ·019	− ·022	− ·020	− ·043
XII.	− ·050	− ·056	− ·088	− ·006	− ·013	− ·025	− ·050	− ·073	− ·102
XIII.	+ ·036	+ ·025	+ ·019	+ ·021	+ ·013	+ ·015	+ ·051	+ ·024	+ ·016
XIV.	+ ·016	+ ·009	+ ·025	− ·024	− ·028	− ·022	+ ·027	+ ·008	+ ·021
XV.	− ·023	− ·004	+ ·040	+ ·006	+ ·025	+ ·031	− ·032	+ ·012	+ ·053

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Residuals of y'.

O–C.

Group.	System A. (All observations combined.)			System B. (All except single Distances.)			System C. (Cape observations only.)		
	All Terms.	Omitting ϵ'	Omitting ϵ' and δ'	All Terms.	Omitting ϵ'	Omitting ϵ' and δ'	All Terms.	Omitting ϵ'	Omitting ϵ' and δ'
	″	″	″	″	″	″	″	″	″
II.	+ 0·003	− 0·002	+ 0·082	− 0·006	− 0·011	+ 0·058	+ 0·012	− 0·027	+ 0·049
III.	− ·019	− ·019	+ ·003	− ·018	− ·017	− ·001	− ·009	− ·005	+ ·016
IV.	+ ·023	+ ·027	− ·004	+ ·011	+ ·015	− ·012	+ ·002	+ ·022	− ·003
V.	+ ·003	+ ·005	− ·048	+ ·019	+ ·020	− ·024	− ·009	+ ·001	− ·043
VI.	− ·003	− ·003	− ·052	− ·066	− ·067	− ·108	+ ·014	+ ·013	− ·030
VII.	− ·014	− ·016	− ·038	− ·025	− ·028	− ·045	− ·011	− ·025	− ·045
VIII.	− ·033	− ·036	− ·039	+ ·006	+ ·003	+ ·002	− ·031	− ·046	− ·052
IX.	+ ·031	+ ·028	+ ·038	+ ·033	+ ·030	+ ·039	+ ·016	+ ·002	+ ·007
X.	− ·015	− ·018	·000	− ·032	− ·034	− ·018	− ·002	− ·014	− ·002
XI.	+ ·012	+ ·012	+ ·045	+ ·010	+ ·010	+ ·040	+ ·010	+ ·011	+ ·037
XII.	− ·017	− ·014	+ ·021	− ·003	− ·001	+ ·029	− ·018	− ·002	+ ·027
XIII.	+ ·014	+ ·017	+ ·039	+ ·002	+ ·006	+ ·022	+ ·019	+ ·040	+ ·059
XIV.	− ·021	− ·019	− ·031	− ·025	− ·023	− ·040	− ·043	− ·030	− ·038
XV.	+ ·015	+ ·009	− ·062	+ ·008	+ ·001	− ·070	+ ·024	− ·010	− ·068

These results correspond with the original solution given in the *Monthly Notices* of the Royal Astronomical Society, Vol. LIV., pp. 346–349.

They show that no advantage in accuracy is gained by the introduction of terms depending on t^4 in the development of the errors of the Ephemeris—in fact, the *mean error* of an observation of weight *unity* is thereby increased—and it is almost doubtful if the terms depending on t^3 are real.

Having regard to the somewhat empiric form of the corrections applied to the single distances (and as these corrections have only a small influence on the equations based on double distances) the mean values of α, β, γ, δ and of α', β', γ' and δ' were adopted—a process which is equivalent to giving half weight to the single distances. The resulting values of x'' and y'' computed for each day were employed as preliminary corrections of Ephemeris II. for the final solution given in the next chapter, in which a term depending on the Lunar Perturbation of the Earth is introduced into each equation.

When, in the final solution, the values of $\Delta x''$ and $\Delta y''$ were determined in terms of μ' for each group,* an apparently inexplicable discordance was found between the

* The factor of μ', employed (as a matter of convenience) in the next chapter, is *one-tenth* of the effect of the Tabular Lunar Perturbation of the Earth on the Tabular Distance or Position-Angle. In the present chapter (as already explained at p. 468) the factor of μ is the entire effect of the Perturbation in question. Consequently—

$$\mu' \text{ is } = 10\mu.$$

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rigorously computed factor of μ' and the factor of μ computed for the mean epoch of each group. Examination showed that the computations had been correctly made; but, as the result of a badly formed figure 7, the factor $-$ 7·12 had been copied and checked as $-$ 1·12 for the factor of μ_x in Group XI.

It has been considered sufficient to solve the Equations for System A with the corrected factor of μ, and for the case in which the terms ϵ and ϵ' are omitted. The results are—

α = $-$ 0·18835	Weight	158	α' = + 0·66870	Weight	176
β = $-$ ·04860	,,	214	β' = + ·03494	,,	261
γ = $-$ ·00810	,,	3523	γ' = $-$ ·00630	,,	3779
δ = + ·00675	,,	134	δ' = $-$ ·04961	,,	155

μ = + 0·00675 Weight 8004.

The resulting value of μ is thus diminished by 0·00212, whilst the corrections to the Ephemeris remain practically unchanged.

The changes in the values of the preceding residuals are so small that it has not been considered necessary to recompute them.

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CHAPTER VI.

FINAL SOLUTION FROM EPHEMERIS II.

It is now desirable to make a final Solution, in which a term depending on the Lunar Perturbation of the Earth is introduced into each equation.

The equations formed by comparison with Ephemeris II. were first corrected for the tabular errors of the planet derived from the following expressions—

$$x'' = -\ 0''\cdot2114\,\frac{1}{\Delta} - 0''\cdot0443\,\frac{t}{10\Delta} - 0''\cdot0053\,\frac{t^2}{100\Delta} + 0''\cdot0205\,\frac{t^3}{10{,}000\Delta}$$

$$y'' = +\ 0''\cdot6672\,\frac{1}{\Delta} + 0''\cdot0338\,\frac{t}{10\Delta} - 0''\cdot0056\,\frac{t^2}{100\Delta} - 0''\cdot0480\,\frac{t^3}{10{,}000\Delta}$$

These corrections represent the mean results of the original solutions A and B of the preceding chapter, omitting the term depending on the Lunar Equation. The adoption of the mean of Systems A and B is equivalent to giving half weight to the observations of single distances.

The new equations then assume the form :—

For the Distances—

$$f'\,\Delta x'' + f''\,\Delta y'' + f'''\,z = (\text{O–C}) + \tfrac{1}{10}\,(f'l_x + f''l_y)\,\mu' + \frac{1000}{s}\,\Delta\text{N} + \frac{ds}{dt}\,n$$

For the Position-Angles—

$$f_p'\,\Delta x'' + f_p''\,\Delta y'' + f_p'''\,z = (\text{O–C}) + \tfrac{1}{10}\,(f_p'l_x + f_p''l_y)\,\mu' + \left(s \sin 1''\,\frac{dp}{dt}\right) n'$$

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Where for N will be written A, G, E, &c., according to the first letter of the observer's name.

And for n or n' will be written a or a', g or g', &c., respectively.

l_x and l_y are respectively the effects of the tabular Lunar Perturbation of the Earth on the co-ordinates x'' and y'' of the planet.

(The values of $\frac{1}{10}l_x$ and $\frac{1}{10}l_y$ are given in the following Table, p. 475, and in computing the factors of μ', the values of $\frac{1}{10}l_x$ and $\frac{1}{10}l_y$ have been interpolated for the exact epoch of each observation.)

The corrections of the values of O–C, derived from comparison with Ephemeris I. (pp. 270–381), have been computed as follows:—

For the Distances—

$$(\text{O–C}) = \left\{ \begin{array}{l} \sin p \left\{ (\alpha_1 - \alpha_2) \cos \delta + x - x'' \right\} + \cos p \left(\delta_1 - \delta_2 + y - y'' \right) \\ + \dfrac{d^2}{2s} + \dfrac{s}{1000} . \Delta\sigma + s . \sin^2 \tfrac{1}{2} \psi + \left\{ \begin{array}{l} \text{In the case of Yale Obs. correction} \\ \text{for division error.} \end{array} \right\} + \dfrac{1000}{s} \text{N} \end{array} \right.$$

For the Position-Angles—

$$(\text{O–C}) = \left\{ \begin{array}{l} \cos p \left\{ (\alpha^1 - \alpha^2) \cos \delta + x - x'' \right\} - \sin p \left(\delta_1 - \delta_2 + y - y'' \right) \\ + s \sin 1'' \left(p_2 - p_1 + \Delta p \right) \end{array} \right.$$

Where x'' and y'' are taken for the epoch of observations from the following Table, and the adopted values of N are—

For Auwers' observations	A = + 0·088″		For Hall's observations,	H = + 0·252″
„ Gill's „	G = + 0·095		„ Peter's „	P = − 0·010
„ Elkin's „	E = + 0·319		„ Schur's „	S = + 0·407

The significance of the other terms will be found on page 452.

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VALUES OF x'' AND y'' WITH THE CORRESPONDING COEFFICIENTS OF $'$.

Group.	Date, Berlin Noon.	x''	$\frac{1}{10} l_x$	y''	$\frac{1}{10} l_y$
	1889.	″	″	″	″
	June 7	− 0·263	− 0·55	+ 0·775	+ 0·01
	8	− ·254	− ·59	+ ·765	− ·02
	9	− ·246	− ·62	+ ·755	− ·06
I.	10	− ·239	− ·62	+ ·744	− ·09
	11	− ·233	− ·57	+ ·736	− ·12
	12	− ·227	− ·48	+ ·729	− ·14
	13	− ·221	− ·38	+ ·723	− ·16
	14	− ·216	− ·22	+ ·718	− ·17
II.	15	− ·211	− ·06	+ ·713	− ·17
	16	− ·207	+ ·09	+ ·709	− ·15
	17	− ·203	+ ·25	+ ·705	− ·12
	18	− ·199	+ ·39	+ ·702	− ·09
III.	19	− ·195	+ ·52	+ ·700	− ·05
	20	− ·192	+ ·63	+ ·698	− ·01
	21	− ·190	+ ·69	+ ·698	+ ·03
	22	− ·188	+ ·73	+ ·698	+ ·07
	23	− ·186	+ ·73	+ ·699	+ ·11
	24	− ·185	+ ·70	+ ·700	+ ·15
	25	− ·184	+ ·62	+ ·700	+ ·18
IV.	26	− ·183	+ ·49	+ ·702	+ ·20
	27	− ·183	+ ·36	+ ·704	+ ·22
	28	− ·184	+ ·23	+ ·707	+ ·22
	29	− ·185	+ ·10	+ ·710	+ ·22
	30	− ·186	− ·05	+ ·714	+ ·21
	July 1	− ·187	− ·19	+ ·718	+ ·18
	2	− ·188	− ·34	+ ·722	+ ·14
V.	3	− ·190	− ·49	+ ·727	+ ·10
	4	− ·193	− ·62	+ ·732	+ ·06
	5	− ·197	− ·70	+ ·737	+ ·01
	6	− ·200	− ·73	+ ·742	− ·04
	7	− ·203	− ·73	+ ·748	− ·09
	8	− ·207	− ·68	+ ·754	− ·13
VI.	9	− ·211	− ·59	+ ·759	− ·17
	10	− ·216	− ·47	+ ·765	− ·20
	11	− ·221	− ·31	+ ·770	− ·22
	12	− ·226	− ·12	+ ·776	− ·22
VII.	13	− ·230	+ ·06	+ ·781	− ·22
	14	− ·235	+ ·24	+ ·786	− ·19
	15	− ·240	+ ·42	+ ·791	− ·15
	16	− ·245	+ ·57	+ ·796	− ·10
	17	− ·250	+ ·69	+ ·801	− ·05
	18	− ·255	+ ·75	+ ·805	·00
	19	− ·260	+ ·76	+ ·809	+ ·05

Date. Berlin Noon.	x''	$\frac{1}{10} l_x$	y''	$\frac{1}{10} l_y$	Group.
1889.	″	″	″	″	
July 20	− 0·266	+ 0·75	+ 0·813	+ 0·11	
21	− ·270	+ ·73	+ ·815	+ ·15	VIII.
22	− ·277	+ ·66	+ ·818	+ ·20	
23	− ·283	+ ·51	+ ·820	+ ·22	IX.
24	− ·288	+ ·40	+ ·823	+ ·24	
25	− ·294	+ ·24	+ ·825	+ ·25	
26	− ·300	+ ·08	+ ·826	+ ·25	X.
27	− ·305	− ·10	+ ·826	+ ·24	
28	− ·310	− ·26	+ ·826	+ ·22	
29	− ·315	− ·41	+ ·824	+ ·18	
30	− ·320	− ·55	+ ·822	+ ·13	
31	− ·325	− ·64	+ ·819	+ ·08	XI.
Aug. 1	− ·330	− ·71	+ ·817	+ ·04	
2	− ·335	− ·74	+ ·813	− ·02	
3	− ·339	− ·73	+ ·808	− ·07	
4	− ·342	− ·67	+ ·802	− ·11	
5	− ·346	− ·56	+ ·796	− ·15	
6	− ·350	− ·43	+ ·788	− ·19	XII.
7	− ·353	− ·31	+ ·780	− ·21	
8	− ·356	− ·16	+ ·771	− ·21	
9	− ·359	+ ·01	+ ·761	− ·21	
10	− ·360	+ ·19	+ ·750	− ·19	
11	− ·362	+ ·37	+ ·739	− ·15	
12	− ·365	+ ·51	+ ·727	− ·11	
13	− ·367	+ ·61	+ ·713	− ·07	XIII.
14	− ·368	+ ·69	+ ·697	− ·01	
15	− ·369	+ ·71	+ ·681	+ ·03	
16	− ·370	+ ·71	+ ·664	+ ·08	
17	− ·370	+ ·66	+ ·647	+ ·12	
18	− ·370	+ ·58	+ ·629	+ ·16	
19	− ·370	+ ·48	+ ·610	+ ·18	XIV.
20	− ·369	+ ·34	+ ·588	+ ·20	
21	− ·368	+ ·21	+ ·566	+ ·21	
22	− ·366	+ ·08	+ ·543	+ ·21	
23	− ·364	− ·07	+ ·521	+ ·20	
24	− ·362	− ·21	+ ·498	+ ·18	XV.
25	− ·359	− ·35	+ ·467	+ ·15	
26	− ·356	− ·46	+ ·442	+ ·12	
27	− ·353	− ·54	+ ·415	+ ·07	
28	− ·349	− ·60	+ ·389	+ ·04	
29	− ·345	− ·64	+ ·361	− ·01	
30		− ·64		− ·05	
31		− ·60		− ·09	

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The comparison between the observed and computed quantities then leads to the following equations :—

GROUP I.

Double Distances.

Set.	Date B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O-C) + &c.				p	v_1	Definitive Residuals.
	June					″					″	″
I. 1	10·71	$\kappa\ \mu$	+0·83	−0·56	−0·63	+0·332	+0·42 μ'	−0·37 g	−0·04 ΔG	2·95	+0·255	+0·25
2	11·58	$\kappa\ \mu$	+ ·84	− ·52	+ ·55	+ ·248	+ ·37	− ·36 s	+ ·07 ΔS	0·63	+ ·176	+ ·18

GROUP II.

Double Distances.

	June											
II. 1	15·70	$\theta\ \mu$	+0·53	−0·85	−0·63	+0·327	−0·16 μ'	−0·59 a	−0·02 ΔA	1·53	+0·260	+0·29
2	17·70	$\theta\ \mu$	+ ·56	− ·82	− ·68	− ·120	− ·28	− ·60 a	+ ·08 ΔA	2·86	− ·185	− ·15
3	18·71	$\theta\ \mu$	+ ·59	− ·79	− ·71	+ ·110	− ·33	− ·60 g	+ ·13 ΔG	5·21	+ ·048	+ ·05
4	17·48	$\theta\ \mu$	+ ·55	− ·83	+ ·87	+ ·165	− ·27	− ·62 p	+ ·06 ΔP	1·97	+ ·100	·00
5	18·52	$\theta\ \mu$	+ ·58	− ·80	+ ·80	+ ·148	− ·32	− ·61 p	+ ·12 ΔP	3·33	+ ·085	− ·01
6	17·75	$\theta\ \mu$	+ ·56	− ·82	+ ·78	− ·365	− ·28	− ·59 h	+ ·08 ΔH	0·72	− ·430	− ·43
7	18·73	$\theta\ \mu$	+ ·59	− ·79	+ ·80	− ·039	− ·33	− ·60 e	+ ·13 ΔE	1·43	− ·101	− ·10
8	18·57	$\theta\ \mu$	+ ·59	− ·80	+ ·74	− ·164	− ·33	− ·60 s	+ ·13 ΔS	0·63	− ·227	− ·23

Double Position-Angles.

II. 9	16·49	$\theta\ \mu$	−0·84	−0·53	−0·60	−0·137	+0·07 μ'	−0·09 a'	Observer A	3·60	−0·101	−0·10
10	17·47	$\theta\ \mu$	− ·82	− ·55	− ·66	− ·045	+ ·20	− ·07 g'	„ G	2·34	− ·005	·00
11	18·44	$\theta\ \mu$	− ·80	− ·58	− ·77	− ·026	+ ·32	− ·07 a'	„ A	3·60	+ ·018	+ ·02
12	18·58	$\theta\ \mu$	− ·80	− ·59	+ ·44	+ ·123	+ ·34	− ·09 p'	„ P	1·18	+ ·169	+ ·17

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GROUP III.

Double Distances.

Set.	Date B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	June					″					″	″
III. 2	21·46	θ λ	+0·88	−0·45	+0·24	−0·003	−0·60 μ′	−0·56 g	−0·06 ΔG	2·95	−0·081	−0·08
3	22·46	θ λ	+ ·88	− ·47	+ ·22	− ·169	− ·60	− ·60 a	+ ·33 ΔA	3·26	− ·238	− ·20
4	22·70	θ λ	+ ·90	− ·44	− ·78	+ ·212	− ·61	− ·58 g	+ ·47 ΔG	1·58	+ ·144	+ ·14
9	22·73	θ λ	+ ·89	− ·45	+ ·68	− ·154	− ·61	− ·59 e	+ ·47 ΔE	1·43	− ·222	− ·22
10	22·77	θ λ	+ ·90	− ·44	+ ·51	+ ·115	− ·61	− ·60 h	+ ·50 ΔH	0·37	+ ·047	+ ·05
14	21·46	θ λ	+ ·88	− ·45	+ ·73	+ ·348	− ·60	− ·58 p	− ·06 ΔP	1·07	+ ·275	+ ·18
15	22·52	θ λ	+ ·88	− ·47	+ ·61	+ ·205	− ·60	− ·59 p	+ ·36 ΔP	3·33	+ ·138	+ ·05
19	22·58	θ λ	+ ·89	− ·46	+ ·43	+ ·272	− ·61	− ·60 s	+ ·39 ΔS	1·24	+ ·204	+ ·20

Double Position-Angles.

III. 22	21·42	θ λ	−0·44	−0·88	−0·76	−0·082	+0·36 μ′	−0·27 g′	Observer G	4·99	−0·053	−0·05
23	22·44	θ λ	− ·47	− ·88	− ·70	− ·011	+ ·42	− ·24 a′	,, A	7·68	+ ·023	+ ·02
24	22·69	θ λ	− ·45	− ·89	− ·17	+ ·066	+ ·42	− ·25 g′	,, G	4·99	+ ·100	+ ·10
29	22·73	θ λ	− ·44	− ·89	+ ·46	− ·002	+ ·41	− ·24 e′	,, E	2·03	+ ·031	+ ·03
30	22·77	θ λ	− ·44	− ·90	+ ·56	+ ·207	+ ·41	− ·24 h′	,, H	0·57	+ ·240	+ ·24
34	21·54	θ λ	− ·45	− ·88	+ ·66	+ ·301	+ ·36	− ·27 s′	,, S	0·91	+ ·331	+ ·33

Single Distances.

III. 1	19·42	λ	−0·85	−0·52	−0·82	−0·069	+0·47 μ′	+0·02 g	+0·94 Δ G	3·48	−0·013	−0·01
5	23·45	θ	+0·99	− ·15	+ ·46	− ·031	− ·69	− ·50 g	+1·37 Δ G	4·36	− ·101	− ·10
6	25·67	θ	−0·25	+ ·97	+ ·60	− ·133	− ·05	+ ·57 a	+1·03 Δ A	2·76	− ·133	− ·16
7	20·73	λ	−0·99	+ ·09	− ·49	− ·495	+ ·66	+ ·41 e	+0·76 Δ E	0·32	− ·416	− ·42
8	20·80	λ	−0·99	+ ·12	− ·18	− ·539	+ ·67	+ ·43 h	+0·75 Δ H	0·39	− ·460	− ·46
11	23·77	θ	+1·00	+ ·06	+ ·17	− ·277	− ·72	− ·43 e	+1·69 Δ E	0·32	− ·351	− ·35
12	23·87	θ	+0·99	+ ·15	− ·36	+ ·516	− ·71	− ·38 h	+1·82 Δ H	0·27	+ ·446	+ ·45
13	20·52	λ	−1·00	+ ·01	− ·25	− ·014	+ ·66	+ ·36 p	+0·81 Δ P	1·35	− ·065	+ ·13
16	24·57	θ	+0·52	+ ·85	− ·70	− ·330	− ·48	+ ·15 p	+2·08 Δ P	1·35	− ·372	− ·33
17	25·49	θ	−0·18	+ ·98	− ·87	+ ·107	− ·09	+ ·55 p	+1·16 Δ P	2·28	+ ·104	+ ·20
20	24·47	θ	+0·63	+ ·77	− ·38	− ·241	− ·54	+ ·74 s	+2·12 Δ S	0·93	− ·289	− ·29
21	25·47	θ	−0·17	+ ·99	− ·88	+ ·247	− ·09	+ ·55 s	+1·19 Δ S	0·93	+ ·244	+ ·24

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GROUP III.—*continued.*

SINGLE POSITION-ANGLES.

Set.	Date B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	June										″	″
III. 25	23·49	θ	−0·13	−0·99	−0·48	−0″·323	+0·22 μ′	−0·42 g′	Observer G	1·40	−0·310	−0·31
27	20·73	λ	+ ·09	+1·00	− ·67	− ·113	− ·08	+ ·48 e′	„ E	1·13	− ·109	− ·11
28	20·80	λ	+ ·12	+0·99	− ·71	+ ·138	− ·10	+ ·47 h′	„ H	0·47	+ ·139	+ ·14
31	23·77	θ	+ ·06	−1·00	+ ·74	+ ·235	+ ·10	− ·51 e′	„ E	2·09	+ ·237	+ ·24
32	23·87	θ	+ ·15	−0·99	+ ·68	− ·197	+ ·03	− ·54 h′	„ H	0·31	− ·202	− ·20
33	20·48	λ	− ·01	+1·00	− ·81	− ·176	·00	+ ·53 s′	„ S	0·33	− ·163	− ·16
35	24·50	θ	+ ·80	−0·60	+ ·75	− ·264	− ·43	− ·82 s′	„ S	0·33	− ·310	− ·31
36	25·50	θ	+ ·98	+0·18	+ ·14	− ·443	− ·58	− ·40 s′	„ S	0·33	− ·501	− ·50
37	19·50	λ	− ·48	+0·87	− ·87	+ ·331	+ ·31	+ ·59 p′	„ P	0·47	+ ·385	+ ·38
38	20·51	λ	+ ·01	+1·00	− ·82	+ ·277	− ·02	+ ·51 μ′	„ P	1·19	+ ·288	+ ·29
40	25·50	θ	+ ·98	+0·18	+ ·13	+ ·275	− ·58	− ·41 p′	„ P	1·46	+ ·217	+ ·22

GROUP IV.

DOUBLE DISTANCES.

	June											
IV. 1	26·42	ε λ	+0·62	−0·75	+0·01	+0·041	−0·12 μ′	−0·65 a	−0·02 ΔA	2·86	+0·024	+0·06
2	26·66	ζ ι	+ ·27	+0·97	+ ·32	+ ·224	− ·31	+ ·29 g	+ ·03 ΔG	2·95	+ ·196	+ ·20
3	27·44	ζ ι	+ ·25	+0·97	+ ·61	− ·003	− ·29	+ ·27 g	+ ·02 ΔG	5·21	− ·030	− ·03
4	27·68	ε λ	+ ·55	−0·80	− ·72	− ·024	+ ·03	− ·69 a	+ ·06 ΔA	2·86	− ·027	+ ·01
5	28·43	ζ η	+ ·01	+1·00	+ ·49	+ ·178	− ·22	+ ·41 a	− ·04 ΔA	2·86	+ ·157	+ ·13
6	28·69	γ λ	+ ·57	−0·78	− ·77	− ·222	+ ·09	− ·64 g	·00 ΔG	5·21	− ·219	− ·22
7	29·44	ζ η	+ ·04	+1·00	+ ·51	− ·027	− ·22	+ ·39 g	− ·07 ΔG	5·21	− ·050	− ·05
8	29·67	γ λ	+ ·52	−0·81	− ·71	− ·009	+ ·17	− ·63 a	+ ·02 ΔA	2·69	+ ·004	+ ·04
9	30·43	δ ε	+ ·14	+ ·98	+ ·56	+ ·007	− ·18	+ ·31 a	+ ·08 ΔA	4·31	− ·016	− ·03
10	30·68	y θ	+ ·71	− ·70	− ·81	− ·015	+ ·24	− ·73 g	− ·07 ΔG	5·21	·000	·00
	July											
11	1·44	δ ε	+ ·12	+ ·99	+ ·54	+ ·023	− ·13	+ ·30 g	− ·02 ΔG	2·01	+ ·003	·00
12	1·68	y θ	+ ·72	− ·70	− ·83	− ·212	+ ·31	− ·73 a	·00 ΔA	2·86	− ·190	− ·15
13	2·42	α η	+ ·60	+ ·80	+ ·75	− ·015	+ ·14	− ·09 a	+ ·01 ΔA	3·47	− ·020	− ·01
14	2·68	y θ	+ ·72	− ·70	− ·84	− ·206	+ ·39	− ·72 g	+ ·05 ΔG	3·71	− ·177	− ·18

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GROUP IV.—*continued.*

DOUBLE DISTANCES.—*cont.*

Set.	Date B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	w_1	Definitive Residuals.
	June					″					″	″
IV. 15	26·47	ε λ	+0·61	−0·75	+0·85	+0·142	−0·10 μ'	−0·65 p	−0·02 ΔP	3·33	+0·126	+0·02
16	28·50	γ λ	+ ·58	− ·77	+ ·80	+ ·225	+ ·08	− ·65 p	− ·02 ΔP	1·97	+ ·227	+ ·12
17	29·47	γ λ	+ ·53	− ·80	+ ·86	+ ·061	+ ·16	− ·63 p	+ ·02 ΔP	1·07	+ ·072	− ·03
18	30·48	γ θ	+ ·71	− ·71	+ ·81	− ·037	+ ·23	− ·70 p	− ·08 ΔP	3·33	− ·022	− ·13
19	26·74	ε λ	+ ·60	− ·77	+ ·74	+ ·001	− ·07	− ·68 e	·00 ΔE	1·73	− ·012	− ·01
20	27·70	ε λ	+ ·55	− ·80	+ ·83	+ ·039	+ ·03	− ·65 e	+ ·06 ΔE	1·43	+ ·036	+ ·04
21	29·71	γ λ	+ ·52	− ·81	+ ·79	+ ·180	+ ·18	− ·64 e	+ ·02 ΔE	1·43	+ ·193	+ ·19
22	29·76	ζ η	+ ·05	+ ·99	− ·73	+ ·203	− ·21	+ ·38 e	− ·08 ΔE	1·43	+ ·179	+ ·18
23	26·48	ε λ	+ ·61	− ·75	+ ·85	− ·233	− ·10	− ·65 s	− ·02 ΔS	1·24	− ·249	− ·25
24	26·57	ε λ	+ ·61	− ·76	+ ·65	+ ·335	− ·10	− ·68 h_g	− ·01 ΔH_g	1·60	+ ·321	+ ·32

GROUP V.

DOUBLE DISTANCES.

	July											
V. 1	3·65	β δ	+0·35	−0·93	−0·69	+0·125	+0·27 μ'	−0·57 a	−0·03 ΔA	3·47	+0·153	+0·18
2	4·41	α γ	+0·31	+ ·95	+ ·67	+ ·107	+ ·16	+ ·10 a	+ ·02 ΔA	3·47	+ ·103	+ ·10
6_x	8·41	x	+1·00	+ ·02	+ ·53	− ·116	+ ·64	− ·74 a	− ·24 ΔA	2·81	− ·077	− ·03
6_y	8·41	y	−0·52	− ·86	− ·71	− ·018	− ·46	+ ·16 a	+ ·17 ΔA	2·81	− ·033	− ·04
6_z	8·41	z	− ·91	+ ·41	− ·26	+ ·144	− ·52	+ ·80 a	+ ·18 ΔA	2·81	+ ·107	+ ·06
9	4·72	β δ	+ ·32	− ·93	+ ·79	− ·038	+ ·24	− ·55 e	+ ·04 ΔE	2·03	− ·011	− ·01
15	4·46	β δ	+ ·34	− ·93	+ ·93	− ·014	+ ·26	− ·56 s	+ ·02 ΔS	1·24	+ ·014	+ ·01

SINGLE DISTANCES.

V. 4	5·47	z	+0·92	−0·39	+0·09	+0·084	+0·65 μ'	−0·79 g	+1·27 ΔG	4·36	+0·128	+0·13
8	7·47	z	− ·91	+ ·42	− ·59	− ·279	− ·60	+ ·79 p	+1·41 ΔP	1·35	− ·321	− ·19
10	5·80	z	+ ·92	− ·39	+ ·22	+ ·144	+ ·65	− ·79 h	+1·82 ΔH	0·27	+ ·189	+ ·19
13	7·67	z	− ·91	+ ·42	− ·73	− ·140	− ·59	+ ·80 h	+1·16 ΔH	0·75	− ·181	− ·18
14	7·76	z	− ·91	+ ·41	− ·36	− ·334	− ·58	+ ·80 e	+1·08 ΔE	0·46	− ·375	− ·37

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GROUP V.—*continued.*

Single Position-Angles.

Set.	Date B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O-C) + &c.				p	v_1	Definitive Residuals.
	July					″					″	″
V. 16	5·43	z	—0·39	—0·92	—0·64	—0·058	—0·29 μ'	—0·02 g'	Observer G	3·14	—0·061	—0·06
19	6·70	z	+ ·54	+ ·84	— ·43	— ·242	+ ·46	— ·14 e'	,, E	1·13	— ·226	— ·23
20	6·74	z	+ ·51	+ ·86	— ·56	— ·107	+ ·44	— ·11 h'	,, H	0·47	— ·094	— ·09
21	7·67	z	+ ·42	+ ·91	— ·48	— ·459	+ ·40	— ·04 h'	,, H	0·24	— ·448	— ·45
22	7·76	z	+ ·41	+ ·91	— ·67	+ ·170	+ ·39	— ·05 e'	,, E	1·63	+ ·181	+ ·18
23	7·46	z	+ ·43	+ ·91	— ·65	+ ·284	+ ·41	— ·03 p'	,, P	0·47	+ ·295	+ ·29

GROUP VI.

Double Distances.

	July											
VI. 2	11·66	wx	+0·43	—0·90	—0·80	+0·059	—0·12 μ'	—0·54 a	—0·01 ΔA	5·63	+0·063	+0·09
3	9·57	xy	+ ·92	+ ·37	— ·48	— ·013	+ ·55	— ·60 p	+ ·27 ΔP	1·97	+ ·015	—0·08
4	11·43	wx	+ ·38	— ·91	+ ·92	+ ·127	— ·11	— ·54 p	— ·32 ΔP	1·07	+ ·133	+ ·05
7	9·61	xy	+ ·92	+ ·38	— ·61	— ·157	+ ·55	— ·60 s	+ ·30 ΔS	0·63	— ·130	— ·13
9	11·50	wx	+ ·39	— ·91	+ ·83	+ ·155	— ·12	— ·53 s	— ·24 ΔS	1·24	+ ·161	+ ·16

Double Position-Angles.

VI. 14	9·45	xy	+0·37	—0·91	+0·91	—0·027	+0·04 μ'	—0·53 p'	Observer P	2·98	—0·011	—0·01
15	9·45	xy	+ ·37	— ·91	+ ·91	+ ·137	+ ·04	— ·53 s'	,, S	0·91	+ ·153	+ ·15
17	11·54	wx	— ·90	— ·43	+ ·51	+ ·015	— ·28	+ ·57 h_g'	,, H_g	2·40	+ ·004	·00

Single Distances.

VI. 1	10·39	x	+0·72	+0·70	+0·80	+0·041	+0·44 μ'	—0·37 a	+1·23 ΔA	8·47	+0·058	+0·08
6	12·77	w	— ·50	— ·86	+ ·69	+ ·123	— ·18	+ ·22 e	+1·41 ΔE	0·46	+ ·125	+ ·12
8	10·58	x	+ ·59	+ ·81	— ·82	— ·183	+ ·39	— ·26 s	+1·35 ΔS	0·93	— ·171	— ·17

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GROUP VI.—*continued.*

Single Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	ν_1	Definitive Residuals.
	July					″					″	″
VI. 10	10·69	x	+0·88	−0·48	−0·96	−0·118	+0·22 μ'	−0·78 g'	Observer G	1·40	−0·098	−0·10
12	12·69	w	− ·91	+ ·42	− ·63	+ ·348	+ ·09	− ·81 h'	„ H	0·40	+ ·350	+ ·35
13	12·77	w	− ·86	+ ·51	− ·34	+ ·056	+ ·13	+ ·79 e'	„ E	1·63	+ ·059	+ ·06
16	10·45	x	+ ·73	− ·68	+ ·82	+ ·207	+ ·15	− ·73 s'	„ S	0·33	+ ·226	+ ·23

GROUP VII.

Double Distances.

	July											
VII. 6	19·33	q t	+1·00	−0·01	+0·69	+0·069	−0·76 μ'	−0·78 g	−0·19 ΔG	5·21	+0·015	+0·01
7	19·66	q t	+1·00	+ ·02	− ·79	− ·097	− ·76	− ·78 a	·00 ΔA	2·82	− ·151	− ·11

Double Position-Angles.

VII. 23	19·37	q t	−0·01	−1·00	−0·53	+0·006	+0·08 μ'	−0·10 g'	Observer G	4·99	+0·021	+0·02
24	19·63	q t	+ ·02	−1·00	− ·56	+ ·114	+ ·08	− ·12 a'	„ A	7·68	+ ·128	+ ·13

Single Distances.

VII. 2	17·40	t	+0·53	−0·85	−0·21	−0·100	−0·40 μ'	−0·54 g	Observer G	4·36	−0·118	−0·12
3	17·65	t	−0·86	− ·51	+ ·37	− ·056	+ ·62	+ ·62 a	„ A	3·76	− ·007	− ·04
4	18·34	t	−1·00	+ ·02	− ·66	− ·051	+ ·76	+ ·80 a	+1·56 ΔA	3·76	+ ·002	− ·04
5	18·65	t	−1·00	+ ·06	+ ·81	− ·119	+ ·76	+ ·77 g	+1·12 ΔG	4·36	− ·067	− ·07
8	15·66	v	−0·62	+ ·78	− ·84	− ·128	+ ·42	+ ·63 h	+2·27 ΔH	0·97	− ·110	− ·11
9	15·75	v	−0·70	+ ·71	− ·51	− ·195	+ ·45	+ ·68 e	+1·96 ΔE	0·46	− ·173	− ·17
14	18·66	t	−1·00	+ ·04	− ·39	− ·037	+ ·76	+ ·81 e	+1·12 ΔE	0·59	+ ·015	+ ·01
15	18·80	t	−1·00	+ ·05	+ ·27	+ ·090	+ ·76	+ ·81 h	+1·00 ΔH	0·64	+ ·143	+ ·14
17	18·54	t	−1·00	+ ·03	+ ·27	− ·270	+ ·76	+ ·81 h_g	+1·21 ΔH_g	1·48	− ·217	− ·22

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GROUP VII.—*continued.*

Single Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O C) + &c.				p	v_1	Definitive Residuals.
	July					″					″	″
VII. 19	17·36	t	−0·74	−0·67	−0·82	+0·040	+0·51 μ'	+0·50 g'	Observer G	3·51	+0·083	+0·08
20	17·64	t	− ·52	+0·85	+ ·84	− ·010	+ ·40	+ ·53 a'	„ A	3·70	+ ·008	+ ·01
21	18·36	t	+ ·02	+1·00	+ ·55	+ ·042	− ·04	+ ·10 a'	„ A	2·61	+ ·029	+ ·03
22	18·64	t	+ ·06	+1·00	+ ·51	+ ·022	− ·08	+ ·08 g'	„ G	1·82	+ ·006	+ ·01
25	15·66	v	+ ·78	+0·62	− ·15	− ·683	− ·33	− ·52 h'	„ H	0·31	− ·714	− ·71
26	15·76	v	+ ·72	+0·70	− ·57	− ·126	− ·31	− ·46 e'	„ E	1·63	− ·157	− ·16
27	17·66	t	− ·55	+0·83	− ·83	+ ·024	+ ·42	+ ·55 h'	„ H	0·47	+ ·044	+ ·04
28	17·78	t	− ·29	+0·96	− ·66	− ·055	+ ·23	+ ·36 e'	„ E	2·09	− ·051	− ·05
29	18·66	t	+ ·04	+1·00	− ·74	+ ·204	− ·06	+ ·08 e'	„ E	2·09	+ ·189	+ ·19
30	18·80	t	+ ·05	+1·00	− ·77	− ·208	− ·08	+ ·07 h'	„ H	0·76	− ·224	− ·22
31	18·58	t	+ ·03	+1·00	− ·87	+ ·143	− ·05	+ ·08 h_g'	„ H_g	2·36	+ ·129	+ ·13

GROUP VIII.

Single Distances.

	July											
VIII. 1	20·34	q	+0·97	+0·24	+0·78	+0·108	−0·76 μ'	−0·73 a	+0·85 ΔA	7·49	+0·052	+0·09
2	20·65	q	+ ·94	+ ·33	− ·56	− ·023	− ·74	− ·72 g	+1·05 ΔG	4·36	− ·079	− ·08
3	21·31	q	+ ·76	+ ·65	+ ·93	+ ·111	− ·65	− ·53 g	+1·82 ΔG	7·14	+ ·059	+ ·06
4	21·65	q	+ ·37	+ ·93	+ ·22	− ·230	− ·42	− ·22 a	Observer A	3·76	− ·267	− ·25
5	22·35	q	− ·63	+ ·77	+ ·04	− ·045	+ ·22	+ ·54 a	+1·79 ΔA	3·76	− ·030	− ·06
7	20·67	q	+ ·95	+ ·32	+ ·03	+ ·510	− ·75	− ·73 e	+1·06 ΔE	0·25	+ ·455	+ ·45
8	21·65	q	+ ·41	+ ·91	− ·54	+ ·208	− ·44	− ·26 h	+2·44 ΔH	0·97	+ ·170	+ ·17
9	21·79	q	+ ·14	+ ·99	− ·79	+ ·082	− ·28	− ·04 e	+2·56 ΔE	0·59	+ ·055	+ ·05
10	22·65	q	− ·80	+ ·60	− ·74	− ·282	+ ·32	+ ·65 e	+1·39 ΔE	0·59	− ·259	− ·26
11	20·60	q	+ ·95	+ ·30	− ·63	+ ·155	− ·74	− ·72 h_g	+1·01 ΔH_g	1·48	+ ·100	+ ·10
12	22·54	q	− ·76	+ ·65	− ·73	− ·193	+ ·30	− ·60 h_g	+1·52 ΔH_g	0·76	− ·172	− ·17

Single Position-Angles.

VIII. 13	20·39	q	+0·25	−0·97	−0·40	+0·060	−0·06 μ'	−0·29 a'	Observer A	5·20	+0·062	+0·06
14	20·61	q	+ ·32	− ·95	− ·72	− ·170	− ·11	− ·34 g'	„ G	3·14	− ·171	− ·17
15	21·36	q	+ ·69	− ·72	+ ·02	+ ·197	− ·36	− ·59 g'	„ G	3·14	+ ·175	+ ·17
16	21·62	q	+ ·90	− ·42	− ·86	+ ·115	− ·54	− ·73 a'	„ A	4·30	+ ·077	+ ·08
17a	22·32	q	+ ·80	+ ·60	+ ·90	+ ·169	− ·61	− ·59 a'	„ A	3·54	+ ·119	+ ·12

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GROUP VIII.—*continued.*

SINGLE POSITION-ANGLES—*cont.*

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	July					″					″	″
VIII. 17b	22·61	q	+0·63	+0·78	0·00	+0·068	−0·53 μ'	−0·44 g'	Observer G	1·40	+0·024	+0·02
18	20·67	q	+ ·32	− ·95	+ ·81	− ·185	− ·10	− ·33 e'	„ E	1·63	− ·186	− ·19
19	21·65	q	+ ·91	− ·40	+ ·64	− ·088	− ·55	− ·75 h'	„ H	0·61	− ·126	− ·13
20	21·79	q	+ ·99	− ·13	− ·23	− ·110	− ·64	− ·79 e'	„ E	1·13	− ·157	− ·16
21	22·65	q	+ ·60	+ ·80	− ·38	+ ·153	− ·51	− ·43 e'	„ E	1·13	+ ·111	+ ·11
22	21·43	q	+ ·73	− ·68	+ ·78	− ·047	− ·40	− ·62 p'	„ P	1·46	− ·072	− ·07
23	20·59	q	+ ·30	− ·96	+ ·70	+ ·259	− ·10	− ·33 h_g'	„ H_g	2·36	+ ·259	+ ·26
24	22·60	q	+ ·62	+ ·78	− ·92	+ ·043	− ·53	− ·44 h_g'	„ H_g	2·36	− ·001	·00

GROUP IX.

DOUBLE DISTANCES.

Set.	Date. B.M.T. 1889.	Comparison Stars.	$\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	July											
IX. 1	23·33	n r	+0·68	+0·73	+0·83	+0·071	−0·49 μ'	−0·49 g	−0·08 ΔG	5·21	+0·029	+0·03
2	23·62	p q	+ ·95	− ·29	− ·86	+ ·023	− ·35	− ·73 a	− ·18 ΔA	5·63	− ·006	+ ·03
3	24·34	n r	+ ·68	+ ·71	+ ·80	− ·047	− ·42	− ·51 a	− ·02 ΔA	3·47	− ·084	− ·05
4	24·63	p q	+ ·96	− ·29	− ·90	+ ·184	− ·22	− ·71 g	+ ·40 ΔG	2·01	+ ·162	+ ·16
5	24·40	p q	+ ·96	− ·27	+ ·56	− ·230	− ·26	− ·71 p	+ ·24 ΔP	1·07	− ·254	− ·36
6	23·65	p q	+ ·96	− ·28	+ ·53	− ·167	− ·36	− ·75 h	− ·18 ΔH	0·54	− ·197	− ·20
7	23·80	n r	+ ·69	+ ·72	− ·81	+ ·068	− ·46	− ·50 e	− ·05 ΔE	1·43	+ ·028	+ ·03
8	24·64	p q	+ ·96	− ·29	+ ·57	+ ·050	− ·22	− ·73 e	+ ·39 ΔE	1·43	+ ·028	+ ·03
9	24·81	n r	+ ·67	+ ·72	− ·84	+ ·018	− ·36	− ·49 h	·00 ΔH	0·54	− ·015	− ·01

DOUBLE POSITION-ANGLES.

Set.	Date. B.M.T. 1889.	Comparison Stars.	$\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
IX. 10	23·39	n r	+0·73	−0·68	−0·08	+0·146	−0·19 μ'	−0·59 g'	Observer G	2·91	+0·132	+0·13
11	23·61	p q	− ·29	− ·95	− ·32	− ·068	+ ·36	+ ·17 a'	„ A	13·24	− ·037	− ·04
12	24·60	p q	− ·29	− ·96	− ·33	− ·090	+ ·33	+ ·19 g'	„ G	4·99	− ·062	− ·06
13	23·65	p q	− ·28	− ·96	+ ·62	− ·043	+ ·35	+ ·18 h'	„ H	0·84	− ·013	− ·01
14	24·41	p q	− ·27	− ·96	+ ·76	− ·304	+ ·33	+ ·19 p'	„ P	1·18	− ·276	− ·28

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GROUP X.

Single Distances.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	July					″					″	″
X. 1	25·36	p	+0·86	−0·51	+0·18	+0·062	−0·03 μ'	−0·65 g	+1·49 ΔG	4·36	+0·052	+0·05
2	25·59	p	+ ·76	− ·64	− ·83	− ·026	+ ·05	− ·57 a	+1·89 ΔA	6·19	− ·030	·00
3	26·31	p	− ·25	− ·97	− ·69	+ ·010	+ ·25	+ ·20 a	+2·86 ΔA	5·10	+ ·031	+ ·02
4	26·58	p	− ·64	− ·77	− ·02	− ·011	+ ·17	+ ·47 g	+2·22 ΔG	3·10	+ ·010	+ ·01
5	27·30	p	− ·91	− ·42	− ·87	− ·184	− ·04	+ ·67 g	+1·19 ΔG	4·36	− ·173	− ·17
6	27·60	p	− ·94	− ·34	+ ·46	+ ·034	− ·11	+ ·67 a	+0·96 ΔA	4·77	+ ·040	·00
7	25·64	p	+ ·73	− ·68	+ ·77	+ ·222	+ ·07	− ·55 h	+1·92 ΔH	1·17	+ ·220	+ ·22
8	25·77	p	+ ·62	− ·79	+ ·41	− ·269	+ ·12	− ·46 e	+2·22 ΔE	0·46	− ·266	− ·27
						Single Position-Angles.						
X. 9	25·31	p	−0·49	−0·87	−0·82	−0·073	+0·31 μ'	+0·35 g'	Observer G	4·09	−0·045	−0·04
10	25·59	p	− ·64	− ·76	·00	− ·008	+ ·29	+ ·47 a'	„ A	2·61	+ ·019	+ ·02
11	26·29	p	− ·98	+ ·20	− ·64	+ ·177	− ·02	+ ·93 a'	„ A	2·61	+ ·187	+ ·19
12	27·34	p	− ·41	+ ·91	+ ·25	+ ·042	− ·27	+ ·27 g'	„ G	3·14	+ ·029	+ ·03
13	27·56	p	− ·35	+ ·94	+ ·68	− ·173	− ·28	+ ·23 a'	„ A	3·31	− ·188	− ·19
15	25·77	p	− ·79	− ·62	+ ·70	+ ·020	+ ·25	+ ·58 e'	„ E	1·63	+ ·047	+ ·05

GROUP XI.

Double Distances.

	July											
XI. 1	28·30	m p	+0·95	+0·30	+0·84	−0·003	+0·23 μ'	−0·66 a	−0·25 ΔA	5·63	−0·002	+0·03
2	28·61	m p	+ ·94	+ ·32	− ·52	− ·110	+ ·27	− ·66 g	+ ·12 ΔG	2·01	− ·106	− ·11
3	29·30	m o	+ ·77	+ ·62	+ ·85	+ ·076	+ ·25	− ·55 g	+ ·01 ΔG	5·21	+ ·080	+ ·08
	August											
5	1·31	k m	+ ·56	− ·82	− ·09	− ·060	+ ·42	− ·28 a	− ·27 ΔA	3·26	− ·055	− ·04
6	1·57	k m	+ ·56	−0·81	− ·80	− ·117	+ ·44	+ ·29 g	− ·02 ΔG	5·21	− ·102	− ·10
7	2·35	i k	+ ·08	+1·00	+ ·54	+ ·030	+ ·10	− ·16 g	− ·35 ΔG	2·95	+ ·038	+ ·04
	July											
8	29·41	l n	+ ·35	−0·93	+ ·88	+ ·001	+ ·31	− ·18 p	·00 ΔP	1·97	+ ·015	− ·01
9	30·54	m o	+ ·73	+ ·67	− ·80	+ ·279	+ ·37	− ·53 p	+ ·54 ΔP	3·33	+ ·202	+ ·21
	August											
11	1·38	k m	+ ·57	− ·81	+ ·86	+ ·092	+ ·43	− ·28 p	− ·22 ΔP	1·97	+ ·106	+ ·06
12	2·70	i k	+ ·12	+ ·98	− ·73	+ ·307	+ ·15	− ·17 e	− ·14 ΔE	0·71	+ ·318	+ ·32
13	3·73	h i	+ ·59	− ·81	+ ·47	− ·009	+ ·33	− ·24 e	− ·06 ΔE	0·74	− ·005	·00
14	3·77	h i	+ ·59	− ·81	+ ·36	+ ·093	+ ·32	− ·25 h	− ·04 ΔH	0·37	+ ·097	+ ·10
16	1·41	k m	+ ·58	− ·81	+ ·81	+ ·147	+ ·43	− ·29 s	− ·19 ΔS	1·24	+ ·161	+ ·16

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GROUP XI.—*continued.*

Double Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	July					″					″	″
XI. 18	28·33	m p	+0·30	−0·95	−0·32	−0·046	+0·29 μ'	−0·18 a'	Observer A	13·24	−0·031	−0·03
19	28·58	m p	+ ·30	− ·95	− ·70	+ ·261	+ ·30	− ·18 g'	„ G	3·48	+ ·275	+ ·27
	August											
21	1·29	k m	− ·82	− ·55	− ·86	+ ·046	− ·58	+ ·58 a'	„ A	13·24	+ ·022	+ ·02
22	1·53	k m	− ·81	− ·59	+ ·10	+ ·047	− ·59	+ ·56 g'	„ G	4·99	+ ·022	+ ·02
23	2·33	i k	+ ·99	− ·08	+ ·47	− ·085	+ ·73	− ·59 g'	„ G	4·99	− ·056	− ·06
24	2·70	i k	+ ·98	− ·13	+ ·03	+ ·564	+ ·71	− ·58 e'	„ E	0·53	+ ·590	+ ·59
25	3·73	h i	− ·81	− ·59	+ ·60	− ·106	− ·62	+ ·53 e'	„ E	1·06	− ·132	− ·13
25*a*	3·77	h i	− ·81	− ·59	+ ·76	+ ·298	− ·61	+ ·52 h'	„ H	0·57	+ ·272	+ ·27
28	1·52	k m	− ·81	− ·59	+ ·72	+ ·057	− ·59	+ ·55 p'	„ P	2·16	+ ·032	+ ·03
31	1·52	k m	− ·81	− ·59	+ ·71	+ ·032	− ·59	+ ·55 h_g'	„ H_g	4·72	+ ·007	+ ·01

Single Distances.

Set.	Date. B.M.T. 1889.	Comparison Stars.	$\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
	July											
XI. 4	31·56	m	+0·15	+0·99	+0·43	−0·028	+0·04 μ'	−0·17 a	+1·45 ΔA	3·76	−0·025	−0·01
10	31·44	m	+ ·27	+ ·96	− ·79	+ ·119	+ ·12	− ·24 p	+1·41 ΔP	1·86	+ ·124	+ ·10
15	31·47	m	+ ·20	+ ·97	− ·86	− ·010	+ ·08	− ·23 s	+1·45 ΔS	0·93	− ·007	− ·01
17	31·57	m	+ ·15	+ ·99	− ·88	+ ·141	+ ·04	− ·17 h_g	+1·47 ΔH_g	1·48	+ ·144	+ ·14

Single Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	$\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
XI. 20	31·56	m	+0·90	−0·15	−0·68	−0·030	+0·68 μ'	−0·62 a'	Observer A	2·61	−0·004	0·00
26	31·39	m	+ ·95	− ·31	+ ·52	+ ·119	+ ·66	− ·59 p'	„ P	0·86	+ ·145	+ ·14
27	31·53	m	+ ·98	− ·19	− ·11	− ·258	+ ·68	− ·62 p'	„ P	0·47	− ·233	− ·23
29	31·47	m	+ ·97	− ·24	+ ·20	+ ·236	+ ·66	− ·61 s'	„ S	0·33	+ ·261	+ ·26
30	31·57	m	+ ·99	− ·15	− ·29	− ·062	+ ·68	− ·62 h_g'	„ H_g	2·36	− ·036	− ·04

GROUP XII.

Double Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	$\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_1	Definitive Residuals.
XII. 31	August 4·53	g i	−0·53	−0·85	+0·88	−0·001	−0·21 μ'	+0·38 h_g'	Observer H_g	4·72	−0·023	−0·02

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GROUP XII.—*continued.*

Single Distances.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O-C) + &c.				p	v_1	Definitive Residuals.
	August					″					″	″
XII. 1	5·35	g	+0·62	−0·78	−0·14	−0·048	+0·19 μ'	−0·25 a	+1·39 ΔA	5·10	−0·052	−0·04
2	6·28	f	+ ·90	+ ·44	+ ·81	− ·098	+ ·45	− ·50 g	+1·27 ΔG	7·14	− ·085	− ·08
3	6·58	f	+ ·88	+ ·48	− ·39	− ·149	+ ·41	− ·49 a	+1·56 ΔA	6·19	− ·137	− ·11
4	7·26	f	+ ·81	+ ·59	+ ·87	− ·086	+ ·35	− ·46 a	+1·47 ΔA	6·19	− ·076	− ·05
5	7·54	f	+ ·67	+ ·74	− ·01	− ·165	+ ·31	− ·43 g	Observer G	4·36	− ·153	− ·15
6	8·28	f	−0·97	+ ·24	− ·51	+ ·208	− ·06	+ ·39 g	„ G	2·46	+ ·226	+ ·23
7	8·61	f	−1·00	− ·06	+ ·75	+ ·175	− ·07	+ ·41 a	„ A	5·33	+ ·191	+ ·17
10	5·62	g	+0·45	− ·89	+ ·77	+ ·218	+ ·07	− ·11 e	+1·45 ΔE	0·59	+ ·208	+ ·21
13	8·71	f	− ·99	− ·14	+ ·29	+ ·639	− ·07	+ ·46 e	+2·94 ΔE	0·17	+ ·654	+ ·65
14	5·45	g	+ ·55	− ·83	+ ·71	+ ·017	+ ·13	− ·17 s	+1·41 ΔS	0·93	+ ·011	+ ·01
15	6·54	f	+ ·89	+ ·45	− ·69	+ ·058	+ ·42	− ·49 s	+1·52 ΔS	0·47	+ ·071	+ ·07

Single Position-Angles.

XII. 16	5·27	g	−0·75	−0·66	−0·86	+0·171	−0·50 μ'	+0·83 a'	Observer A	4·30	+0·149	+0·15
17	6·32	f	+ ·45	− ·90	− ·24	− ·161	·00	− ·09 g'	„ G	3·14	− ·175	− ·17
18	6·53	f	+ ·47	− ·88	− ·71	− ·037	·00	− ·11 a'	„ A	4·30	− ·052	− ·05
19	7·30	f	+ ·61	− ·79	− ·05	− ·141	·00	− ·12 a'	„ A	2·19	− ·159	− ·16
20	7·58	f	+ ·78	− ·63	− ·88	+ ·149	+ ·05	− ·25 g'	„ G	3·52	+ ·131	+ ·13
21	8·30	f	+ ·20	+0·98	+ ·60	− ·041	+ ·23	− ·25 g'	„ G	3·52	− ·023	− ·02
22	8·55	f	− ·03	+1·00	+ ·53	− ·101	+ ·21	− ·15 a'	„ A	3·70	− ·080	− ·08
23	9·31	f	− ·24	+0·97	+ ·36	+ ·012	+ ·21	− ·07 a'	„ A	4·30	+ ·037	+ ·04
24	5·62	g	− ·89	− ·45	+ ·10	− ·265	− ·50	+ ·53 e'	„ E	1·13	− ·283	− ·28
25	7·59	f	+ ·73	− ·68	+ ·75	+ ·109	+ ·02	− ·23 e'	„ E	1·63	+ ·091	+ ·09
26	7·74	f	+ ·89	− ·44	+ ·02	+ ·020	+ ·09	− ·34 e'	„ E	0·87	+ ·005	·00
27	8·71	f	− ·14	+ ·99	− ·69	− ·195	+ ·20	− ·10 e'	„ E	1·13	− ·171	− ·17
29	5·45	g	− ·83	− ·55	+ ·47	+ ·278	− ·51	+ ·51 s'	„ S	0·33	+ ·259	+ ·26

GROUP XIII.

Double Distances.

	August.											
XIII. 1	10·28	ef	+0·85	+0·48	+0·75	+0·027	−0·12 μ'	−0·41 g	−0·35 ΔG	5·21	+0·006	+0·01
2	10·55	ef	+ ·83	+ ·51	− ·27	− ·087	− ·15	− ·40 a	− ·19 ΔA	3·26	− ·110	− ·09
3	11·26	ef	+ ·78	+ ·58	+ ·81	+ ·067	− ·24	− ·39 a	+ ·16 ΔA	5·63	+ ·041	+ ·06
9	11·48	ef	+ ·75	+ ·62	− ·68	+ ·114	− ·24	− ·38 p	+ ·30 ΔP	1·97	+ ·089	+ ·03
12	10·63	ef	+ ·83	+ ·52	− ·24	+ ·029	− ·16	− ·41 e	− ·15 ΔE	0·74	+ ·006	+ ·01
13	11·59	ef	+ ·74	+ ·62	− ·22	+ ·158	− ·25	− ·39 e	+ ·35 ΔE	0·74	+ ·131	+ ·13

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GROUP XIII.—*continued.*

Double Position-Angles.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	v_i	Definitive Residuals.
	August					″					″	″
XIII.19	10·32	e f	+0·48	−0·85	−0·21	−0·037	−0·27 μ'	−0·05 g'	Observer G	2·50	−0·069	−0·07
20	10·52	e f	+ ·51	− ·83	− ·69	+ ·041	− ·28	− ·05 a'	„ A	13·24	+ ·007	+ ·01
21	11·29	e f	+ ·59	− ·77	− ·05	+ ·045	− ·35	− ·05 a'	„ A	7·68	+ ·006	+ ·01
22	11·53	e f	+ ·62	− ·74	− ·76	+ ·141	− ·38	− ·06 g'	„ G	2·16	+ ·101	+ ·10
26	10·63	e f	+ ·52	− ·83	+ ·68	− ·064	− ·30	− ·05 e'	„ E	2·03	− ·099	− ·10
27	11·59	e f	+ ·62	− ·74	+ ·73	+ ·018	− ·38	− ·06 e'	„ E	2·03	− ·023	− ·02
30	10·37	e f	+ ·49	− ·84	+ ·80	+ ·055	− ·28	− ·05 p'	„ P	1·18	+ ·022	+ ·02
32	10·42	e f	+ ·50	− ·84	+ ·72	+ ·244	− ·29	− ·05 s'	„ S	0·91	+ ·210	+ ·21

Single Distances.

XIII. 4	12·28	e	+0·53	+0·85	+0·72	+0·084	−0·20 μ'	−0·34 g	+1·33 ΔG	5·36	+0·067	+0·07
5	14·35	e	− ·56	+ ·83	+ ·26	+ ·094	+ ·39	− ·03 g	Observer G	4·36	+ ·134	+ ·13
6	16·29	e	− ·91	− ·41	− ·61	+ ·005	+ ·67	+ ·28 g	+1·79 ΔG	4·36	+ ·059	+ ·06
7	16·56	e	− ·89	− ·46	+ ·39	− ·088	+ ·65	+ ·26 a	+1·59 ΔA	3·76	− ·035	− ·05
8	10·48	e	+ ·70	+ ·71	− ·73	+ ·238	− ·08	− ·37 p	+0·74 ΔP	0·74	+ ·225	+ ·17
10	12·49	e	+ ·50	+ ·87	− ·85	− ·032	− ·20	− ·34 p	+1·49 ΔP	2·68	− ·048	− ·09
11	16·49	e	− ·88	− ·47	+ ·65	− ·054	+ ·65	+ ·27 p	+1·61 ΔP	2·68	− ·003	+ ·05
14	16·57	e	− ·87	− ·48	+ ·06	− ·177	+ ·64	+ ·28 e	+1·57 ΔE	0·17	− ·126	− ·13
15	16·72	e	− ·86	− ·51	+ ·05	+ ·272	+ ·63	+ ·28 e	+1·47 ΔE	0·32	+ ·322	+ ·32
17	11·48	f	− ·92	− ·39	+ ·49	+ ·045	+ ·35	+ ·36 s	+0·70 ΔS	0·47	+ ·081	+ ·08
18	16·53	e	− ·88	− ·47	+ ·73	− ·108	+ ·65	+ ·26 s	+1·59 ΔS	0·93	− ·056	− ·06

Single Position-Angles.

XIII.23	14·34	e	+0·83	+0·55	+0·48	+0·165	−0·58 μ'	−0·62 g'	Observer G	2·48	+0·117	+0·12
24	16·35	e	− ·42	+ ·91	+ ·34	+ ·291	+ ·21	− ·12 g'	„ G	1·24	+ ·315	+ ·31
25	16·50	e	− ·45	+ ·89	+ ·66	− ·045	+ ·22	− ·11 a'	„ A	4·30	− ·021	− ·02
28	16·57	e	− ·48	+ ·87	− ·76	+ ·051	+ ·24	− ·11 e'	„ E	1·13	+ ·077	+ ·08
29	16·72	e	− ·51	+ ·86	− ·42	− ·307	+ ·25	− ·10 e'	„ E	1·13	− ·276	− ·28
31	12·36	e	+ ·85	− ·53	+ ·63	+ ·233	− ·42	− ·17 p'	„ P	0·86	+ ·181	+ ·18
33	16·39	e	− ·45	+ ·89	− ·77	− ·307	+ ·22	− ·12 s'	„ S	0·33	− ·282	− ·28

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GROUP XIV.

Double Distances.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O-C) + &c.				p	σ_1	Definitive Residuals.
	August					″					″	″
XIV. 2	18·30	a f	+0·85	+0·52	+0·59	+0·120	−0·56 μ'	−0·25 g	+0·01 ΔG	5·21	+0·075	+0·07
3	19·33	a f	+ ·85	+ ·50	+ ·44	− ·094	− ·46	− ·22 a	+ ·03 ΔA	4·30	− ·131	− ·12
4	19·53	c d	+ ·41	− ·90	− ·71	− ·017	+ ·01	+ ·19 g	− ·33 ΔG	3·71	− ·022	− ·02
6	21·26	b e	+ ·53	+ ·84	+ ·67	+ ·004	− ·27	− ·23 a	− ·23 ΔA	5·63	− ·019	− ·01
7	17·48	a f	+ ·85	+ ·53	− ·65	− ·020	− ·60	− ·26 p	− ·03 ΔP	1·97	− ·068	− ·11
8	18·36	c d	+ ·36	− ·93	+ ·81	+ ·048	− ·04	+ ·18 p	− ·12 ΔP	1·97	+ ·038	+ ·06
9	18·49	a f	+ ·85	+ ·52	− ·67	+ ·023	− ·54	− ·22 p	+ ·01 ΔP	3·33	− ·020	− ·05
11	17·59	c d	+ ·37	− ·92	+ ·72	+ ·027	− ·10	+ ·16 e	+ ·02 ΔE	2·03	+ ·013	+ ·01
12	17·71	a f	+ ·85	+ ·52	− ·63	+ ·236	− ·59	− ·26 e	− ·02 ΔE	1·43	+ ·189	+ ·19
13	18·59	c d	+ ·36	− ·93	+ ·72	+ ·146	− ·03	+ ·18 e	− ·15 ΔE	1·43	+ ·137	+ ·14
14	21·70	b e	+ ·52	+ ·85	− ·73	+ ·216	− ·24	− ·23 e	− ·17 ΔE	1·43	+ ·196	+ ·20
15	17·41	c d	+ ·37	− ·92	+ ·74	− ·095	− ·10	+ ·16 s	+ ·05 ΔS	1·24	− ·110	− ·11
17	20·51	b e	+ ·56	+ ·83	− ·85	− ·193	− ·33	− ·26 s	− ·29 ΔS	1·24	− ·219	− ·22

Single Distances.

XIV. 5	20·51	d	−0·62	+0·79	+0·72	−0·080	0·00 μ'	−0·17 a	+1·05 ΔA	7·49	−0·074	−0·06
10	20·35	d	− ·59	+ ·80	− ·74	+ ·131	·00	− ·16 p	+1·04 ΔP	1·35	+ ·137	+ ·12
16	20·37	d	− ·60	+ ·80	− ·71	− ·147	+ ·01	− ·16 s	+1·04 ΔS	0·93	− ·141	− ·14

GROUP XV.

Single Distances.

	August											
XV. 1	22·31	d	−0·89	+0·45	−0·07	+0·086	−0·07 μ'	−0·11 g	+1·56 ΔG	4·36	+0·085	+0·08
2	22·51	d	−0·92	+ ·38	+ ·72	+ ·044	− ·08	− ·11 a	+1·61 ΔA	6·19	+ ·043	+ ·05
3	23·26	d	−1·00	+ ·08	− ·45	+ ·126	− ·13	− ·49 a	+1·92 ΔA	3·76	+ ·121	+ ·15
4	23·52	d	−1·00	− ·05	+ ·60	− ·111	− ·13	− ·04 g	+1·96 ΔG	5·17	− ·117	− ·12
5	24·53	d	−0·82	− ·57	+ ·26	+ ·014	− ·14	+ ·08 a	+1·96 ΔA	3·76	+ ·009	+ ·00
6	26·28	d	− ·22	− ·98	− ·51	− ·045	·00	+ ·24 g	+1·30 ΔG	4·36	− ·035	− ·03
7	26·48	d	− ·17	− ·98	− ·35	+ ·078	+ ·01	+ ·24 a	+1·22 ΔA	6·34	+ ·089	+ ·08
8	22·71	d	− ·05	+ ·30	+ ·13	− ·246	− ·09	− ·08 e	+1·72 ΔE	0·17	− ·249	− ·25
9	25·46	d	− ·48	− ·88	+ ·80	− ·042	− ·07	+ ·17 p	+1·61 ΔP	1·86	− ·040	·00
10	22·50	d	− ·93	+ ·37	+ ·04	+ ·117	− ·07	− ·12 s	+1·64 ΔS	0·47	+ ·116	+ ·12
11	25·15	d	− ·48	− ·88	+ ·78	+ ·554	− ·07	+ ·17 s	+1·61 ΔS	0·47	+ ·556	+ ·56

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GROUP XV.—*continued.*

SINGLE POSITION-ANGLES.

Set.	Date. B.M.T. 1889.	Comparison Stars.	Resulting Equations. Factor of $\Delta x''$	$\Delta y''$	z	(O–C) + &c.				p	r_1	Definitive Residuals.
	August					″					″	″
XV. 12	22·27	d	+0·47	+0·88	+0·63	+0·047	—0·20 μ'	—0·24 g′	Observer G	4·09	+ ·029	+0·03
13	22·48	d	+ ·39	+0·92	+ ·22	— ·102	— ·20	— ·24 a′	„ A	2·61	— ·119	— ·12
14	23·28	d	+ ·07	+1·00	+ ·48	— ·034	— ·18	— ·26 a′	„ A	2·61	— ·051	— ·05
15	23·47	d	— ·03	+1·00	+ ·46	+ ·067	— ·19	— ·26 g′	„ G	2·48	+ ·050	+ ·05
16	24·54	d	— ·57	+0·82	+ ·77	+ ·043	— ·30	— ·27 a′	„ A	2·61	+ ·018	+ ·02
17	26·30	d	— ·98	+ ·21	— ·20	+ ·173	— ·49	— ·19 g′	„ G	0·79	+ ·133	+ ·13
18	26·49	d	— ·99	+ ·17	+ ·62	— ·060	— ·51	— ·18 a′	„ A	5·20	— ·102	— ·10
19	22·71	d	+ ·30	+ ·95	— ·75	+ ·265	— ·18	— ·24 e′	„ E	1·39	+ ·248	+ ·25
20	25·46	d	— ·88	+ ·48	— ·13	+ ·340	— ·42	— ·22 p′	„ P	1·19	+ ·305	+ ·30
21	22·52	d	+ ·36	+ ·93	— ·86	— ·647	— ·19	— ·24 s′	„ S	0·17	— ·665	— ·66
22	25·49	d	— ·88	+ ·47	— ·07	— ·549	— ·42	— ·23 s′	„ S	0·33	— ·583	— ·58

Besides the observations on which the preceding equations are based, the following were made on June 7 and 8 by Dr. Peter at Leipzig; the full details are given in Vol. II.—at page 144 for the distances, and at page 163 for the position-angles.

Having been made before the regular observations for parallax were commenced, and at a date not included in the original ephemeris, these observations were not included in the preliminary discussion; but, as they help sensibly to strengthen the determination of the planet's motion, they are now reduced.

For the dates in question the results of the observations of the Standard Stars at Leipzig are the following:—

OBSERVATIONS OF STANDARD STARS.—DISTANCES.

Date.	Rotation No.	Sid. Time.	Observed Distance.	Refraction.	Aberration.	Distance 1889·0.	$\Sigma_0 - \Sigma$
1889. June 7	4	18h 17m 21s	6453″·788	+ 2″·404	+ 0″·384	6456″·576	— 0″·058
„ 8	10	17 59 12	4·066	+ 2·635	+ ·376	7·077	— ·559

OBSERVATIONS OF STANDARD STARS.—POSITION-ANGLES.

Date.	Rotation No.	Sid. Time.	Instrumental Position-Angle.	Index Error and Refraction.	Prec., Aberr., Nut., &c.	Observed Pos.-Angle, 1889·0.	Δp
1889. June 7	5	18h 28m 34s	277° 11′ 11″	+ 0′ 44″	+ 0′ 2″	277° 11′ 57″	— 0′ 3″
„ 8	11	13 4	11 12	+ 0 52	+ 0 2	12 6	— 0 12

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For the observations of VICTORIA the Tabular Quantities are :—

DISTANCES.

No.	Star.	Date.	B.M.T. of Obs.	Planet's Right Ascension.	Planet's Declination.	Parallax.		Star Correction.	
						α	δ	α	δ
				° ′ ″	° ′ ″	″	″	″	″
1	μ	June 7	·50848	300 46 50·06	−9 23 4·03	+ 3·80	− 7·51	+ 19·30	+ 3·58
2	μ	„ 7	·51913	50·95	22 58·14	+ 3·51	− 7·55	+ 19·30	+ 3·58
6	κ	„ 7	·57556	46 55·82	22 22·09	+ 1·65	− 7·71	+ 19·51	+ 3·36
8	μ	„ 8	·51036	47 58·05	12 56·84	+ 3·70	− 7·58	+ 19·69	+ 3·71

POSITION-ANGLES.

3	μ	June 7	·53019	300 46 51·88	−9 22 51·41	+ 3·19	− 7·59	+ 19·31	+ 3·58
7	κ	„ 7	·58723	46 56·54	22 16·68	+ 1·35	− 7·73	+ 19·51	+ 3·36
9	μ	„ 8	·51968	47 58·55	12 51·21	+ 3·44	− 7·61	+ 19·69	+ 3·71

COMPARISON of OBSERVED AND TABULAR QUANTITIES :—

DISTANCES.

No.	Star.	Position-Angle.	Observed Distance.	Refraction.	O.	C.	O–C.	Sin p.	Cos p.
		° ′		″	″	″	″		
1	μ	246 35	1976·927	0·544	1977·47	1976·91	+ 0·56	− 0·918	− 0·397
2	μ	246 45	1973·576	0·533	1974·11	1973·82	+ 0·29	− 0·919	− 0·395
6	κ	150 2	3637·465	4·094	3641·56	3641·49	+ 0·07	+ 0·499	− 0·866
8	μ	264 10	1756·565	0·870	1757·44	1757·71	− 0·27	− 0·995	− 0·102

POSITION-ANGLES.

No.	Star.	Distance.	Pos.-Angle corrected for Index Error.	Refraction.	O.	C.	O–C. in Pos.-Angle.	O–C. on Great Circle.	Cos p.	− Sin p.
		″	° ′ ″	′ ″	° ′ ″	′ ″	′ ″	″		
3	μ	1971	246 59 0	− 0 11	246 58 49	59 59	− 1 10	− 0·67	− 0·391	+ 0·920
7	κ	3637	149 56 55	+ 0 58	149 57 53	57 45	+ 0 8	+ 0·14	− 0·866	− 0·500
9	μ	1757	264 26 29	+ 1 36	264 28 5	25 56	+ 1 9	+ 0·59	− 0·096	+ 0·995

In this comparison the observed distances are corrected for Scale-value from the observations of the Standard Stars ; the observed position-angles, after correction for the normal equatorial adjustments, are further corrected by the value of Δp determined from the observations of the Standard Stars.

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The resulting equations of condition are,—

					Weight.
	From the Distances.				
1	$-0{\cdot}92\,\Delta x''$	$-0{\cdot}40\,\Delta y''$	$= +0{\cdot}56$	$-0{\cdot}52\,\mu'$	0·74
2	$-\ {\cdot}92$	$-\ {\cdot}40$	$= +\ {\cdot}29$	$-\ {\cdot}52$	0·74
6	$+\ {\cdot}50$	$-\ {\cdot}87$	$= +\ {\cdot}07$	$+\ {\cdot}29$	0·74
8	$-1{\cdot}00$	$-\ {\cdot}10$	$= -\ {\cdot}27$	$-\ {\cdot}61$	0·74
	From the Position-Angles.				
3	$-0{\cdot}39\,\Delta x''$	$+0{\cdot}92\,\Delta y''$	$= -0{\cdot}67$	$-0{\cdot}22\,\mu$	0·48
7	$-\ {\cdot}87$	$-0{\cdot}50$	$= +\ {\cdot}14$	$-\ {\cdot}50$	0·48
9	$-\ {\cdot}10$	$+1{\cdot}00$	$= +\ {\cdot}59$	$-\ {\cdot}02$	0·48

and the resulting normals, having regard to the weights,—

$$2{\cdot}61\,\Delta x'' \quad + 0{\cdot}28\,\Delta y'' \quad = -0{\cdot}31 \quad + 1{\cdot}52\,\mu'$$
$$0{\cdot}28 \quad + 1{\cdot}80 \quad = -0{\cdot}32 \quad + 0{\cdot}19$$

whence

For Epoch June 8d·0	$\Delta x'' = -0{\cdot}101 + 0{\cdot}580\,\mu'$	Weight 2·57	Group A.
	$\Delta y'' = -\ {\cdot}164 + {\cdot}011$	" 1·77	

The observations of Group I. appear in the previous computations as observations of distance only. But on the evening of June 10, Dr. Auwers also made observations of the planet in position-angle from the star μ; a fixed star was observed in mistake for the planet in the observations of position-angle from the star κ, and there are no observations of the Standard Stars. Although the observation of position-angle in Group I. was, on this account, not utilized in the earlier part of the work, it seems desirable to employ it in the final discussion of the motion of the planet. On June 16, 17 and 18 there are Cape observations of position-angle of the planet from θ and μ made at nearly the same hour-angle as in the observations of June 10. The reduction of these observations gives the following values of Δp:—

	Δp
June 16	$-20''{\cdot}2$
" 17	$-12''{\cdot}8$
" 18	$-16''{\cdot}2$

and adopting the mean of these values (viz., $\Delta p = -16''{\cdot}4$) we have from Auwers' observations, Group I., the following equations:—

					Weight.
From the position-angles	$+0{\cdot}51\,\Delta x''$	$+0{\cdot}86\,\Delta y''$	$= +0''{\cdot}14$	$+0{\cdot}38\,\mu'$	1·60*
From the distances	$+0{\cdot}83$	$-0{\cdot}56$	$= +0{\cdot}33$	$+0{\cdot}42$	2·95
"	$+0{\cdot}84$	$-0{\cdot}52$	$= +0{\cdot}25$	$+0{\cdot}37$	0·63

The normals are,—

$$+2{\cdot}89\,\Delta x'' \quad - 0{\cdot}95\,\Delta y'' \quad = +1{\cdot}06 \quad + 1{\cdot}53\,\mu'$$
$$-0{\cdot}95 \quad + 2{\cdot}28 \quad = -0{\cdot}43 \quad - 0{\cdot}29$$

whence

For epoch June 11d·0	$\Delta x'' = +0{\cdot}354 \quad + 0{\cdot}567\,\mu'$	Weight 2·49	Group I.
	$\Delta y'' = -0{\cdot}041 \quad + 0{\cdot}107$	1·97	

In the values of $\Delta x''$ and $\Delta y''$ thus derived for the epochs June 8d·0 and June 11d·0, the mean value of z has already been shown to be so nearly $= 0$, that the term may be omitted in the equations for determining the planet's motion.

Normal equations were then formed for each of the Groups II. to XV., having regard to the weight of each equation, and on two systems, viz.:—

SYSTEM A—including the equations from all observations combined.

" B—excluding those equations which depend on single distances.

* Diminished from 1·92 on account of the greater uncertainty in the determination of Δp.

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The following are the resulting Normals in $\Delta x''$ and $\Delta y''$:—

SOLUTION A.—NORMAL EQUATIONS RESULTING

NORMALS

Group.	Coefficients of			Absolute Term.	Coefficients of μ'	Coefficients of the undermentioned						
	$\Delta x''$	$\Delta y''$	z			ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g
II.	+12·97	− 3·26	+ 4·85	+ 1·09	− 4·85	+ 0·12	+ 0·41	+0·11	+0·03	+0·29	+0·05	...
III.	+28·73	+ 3·09	+12·92	+ 1·08	−19·92	+ 0·23	+ 3·64	+0·91	+0·37	+0·88	+1·47	...
IV.	+18·70	−14·96	+ 0·10	− 0·71	+ 2·82	+ 0·16	− 0·09	+0·05	...	−0·25	−0·01	−0·01
V.	+14·40	− 0·77	+ 5·53	+ 0·54	+ 9·86	− 1·40	+ 5·09	−0·42	−0·34	−1·74	+0·01	...
VI.	+13·67	+ 0·84	+ 1·81	− 0·04	+ 4·60	+ 7·50	...	−0·33	...	+0·36	+0·80	...
VII.	+27·79	− 0·95	− 0·81	+ 0·91	−20·48	− 5·88	− 5·87	−1·30	−1·99	...	...	−1·81
VIII.	+32·08	+ 2·81	+ 6·54	+ 3·09	−22·88	+ 1·96	+14·16	−0·19	+0·96	...	...	+0·56
IX.	+17·88	+ 6·42	+ 0·15	+ 1·26	− 8·80	− 1·02	+ 0·50	+0·49	−0·09	+0·25	...	...
X.	+23·57	+ 1·30	+ 1·17	+ 0·63	− 0·53	+ 0·94	− 3·55	+0·63	+1·64	...	...	...
XI.	+47·57	+ 7·42	+ 6·74	− 0·57	+29·74	− 1·01	+ 0·11	−0·04	−0·01	+1·79	+0·13	+0·32
XII.	+38·51	+ 4·69	+ 1·50	− 4·24	+12·04	+20·29	+ 8·14	−0·10	...	...	+1·36	...
XIII.	+38·89	− 1·74	+ 0·51	+ 2·32	−19·47	− 5·14	− 4·86	−0·54	...	−0·98	−1·59	...
XIV.	+19·27	+ 2·45	− 0·31	+ 0·96	− 8·77	− 5·49	− 0·47	−0·21	...	−0·92	−0·75	...
XV.	+30·98	+ 0·81	− 8·97	− 0·71	+ 5·78	−23·76	−17·42	−0·28	...	−1·42	−1·09	...

NORMALS

II.	− 3·26	+14·89	+ 3·35	− 0·62	+ 2·91	− 0·17	− 0·54	−0·15	−0·05	−0·41	−0·06	...
III.	+ 3·09	+35·33	+ 0·05	− 0·50	− 5·69	+ 2·24	− 2·84	−0·25	+0·03	+4·45	+2·37	...
IV.	−14·96	+49·53	+15·19	+ 2·12	− 8·58	+ 0·12	− 0·09	−0·21	...	+0·26	+0·02	+0·01
V.	− 0·77	+18·39	+ 2·32	− 0·02	− 0·07	− 0·05	− 2·17	+0·12	+0·18	+0·80	−0·02	...
VI.	+ 0·84	+16·53	+ 1·93	− 0·50	+ 4·42	+ 7·34	...	−0·56	...	+0·51	+1·35	...
VII.	− 0·95	+34·71	+ 6·68	− 0·36	− 0·20	+ 0·12	+ 0·31	+0·66	+1·72	...	...	+0·06
VIII.	+ 2·81	+30·30	+ 5·72	− 0·12	− 6·85	+ 6·71	+ 9·07	+2·07	+2·13	...	...	+1·21
IX.	+ 6·42	+26·17	+ 9·79	+ 1·54	− 8·98	+ 0·24	− 0·53	−0·22	+0·03	−0·07	...	...
X.	+ 1·30	+23·32	+11·17	+ 0·08	− 5·22	−23·18	−10·84	−0·82	−1·51	...	...	...
XI.	+ 7·42	+49·73	+ 9·55	+ 0·81	+ 1·27	+ 5·71	− 0·83	−0·06	+0·01	+4·09	+1·48	+2·17
XII.	+ 4·69	+39·17	+11·54	− 2·17	+ 9·19	+ 4·51	+ 3·97	−0·85	...	...	−0·75	...
XIII.	− 1·74	+44·90	+11·90	+ 0·26	+ 3·47	− 2·53	+ 2·00	−0·27	...	+2·22	−0·82	...
XIV.	+ 2·45	+25·01	+ 2·34	− 0·20	− 6·01	+ 5·19	+ 1·14	−0·05	...	+1·34	+0·41	...
XV.	+ 0·81	+29·41	+ 9·61	+ 0·29	− 3·87	− 7·40	− 3·00	+0·09	...	−2·63	−0·38	...

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FROM ALL THE OBSERVATIONS COMBINED.

IN $\Delta x''$

symbolical corrections in terms of which $\Delta x''$, $\Delta y''$ and z are to be found.

a	g	e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'
−1·43	− 1·85	−0·51	−0·24	−1·85	−0·22	...	+0·47	+0·14	...	...	+0·09	...	...
−2·13	− 4·49	−1·03	−0·46	−2·86	−0·32	...	+0·86	+1·23	+0·20	+0·24	−0·95	−0·02	..
−4·61	− 5·79	−1·68	...	−4·05	−0·49	−0·67	...	...	...	...	...	...	...
−4·95	− 3·17	−0·70	−0·75	−0·97	−0·24	...	...	+0·03	−0·12	−0·03	−0·01	...	...
−3·57	...	−0·05	...	−1·31	−0·75	...	...	−0·96	−1·11	+0·29	−0·59	−0·35	−1·23
−7·22	− 8·68	−0·70	−0·89	...	...	−1·21	−1·04	−1·28	−0·75	−0·27	...	...	+0·01
−6·91	− 5·82	−0·49	−0·10	...	...	−0·68	−4·85	−2·00	−1·35	−0·42	−0·66	...	−0·88
−5·10	− 3·11	−1·51	−0·58	−0·72	...	...	−0·66	−1·54	...	−0·04	−0·06	...	...
−5·93	− 6·04	−0·13	−0·47	...	...	...	−3·46	−1·05	−0·75	...	...	...	...
−4·13	− 2·60	−0·12	−0·05	−1·85	−0·24	−0·04	−8·61	−5·37	−0·76	−0·25	−1·74	−0·20	−3·54
−7·96	− 5·40	−0·11	...	...	−0·29	...	−2·96	−1·00	−1·05	...	...	−0·14	−0·94
−3·65	− 3·81	−0·59	...	−1·85	−0·37	...	−0·35	−1·37	−0·01	...	−0·15	−0·01	...
−1·42	− 0·81	−0·27	...	−0·80	−0·02	...	...	...	...	...	...	...	...
+1·97	+ 0·40	+0·01	...	−0·15	+0·01	...	+1·04	−0·29	−0·10	...	+0·23	+0·05	..

IN $\Delta y''$

+2·17	+ 2·47	+0·68	+0·35	+2·63	+0·30	...	+0·31	+0·09	...	...	+0·06	...	...
+2·45	+ 1·43	+0·38	+0·10	+2·61	+1·37	...	+1·61	+2·87	+2·04	+0·50	+0·91	+0·38	...
+8·02	+11·95	+2·96	...	+4·79	+0·60	+0·84	...	...	...	...	...	...	...
+2·67	+ 1·35	+1·20	+0·34	+0·45	+0·64	...	...	+0·07	−0·20	−0·06	−0·01	...	...
+0·53	...	−0·09	...	+0·10	+0·25	...	...	+0·52	+0·66	−0·13	+1·44	+0·59	−0·59
−1·17	+ 2·26	+0·24	+0·49	...	...	+0·04	+2·84	−0·54	+0·37	+0·17	...	...	+0·18
−0·53	− 3·51	+0·15	−0·22	...	...	−0·62	+1·52	+1·85	+0·24	+0·18	+0·62	...	−0·56
−0·06	− 1·45	−0·21	−0·07	+0·20	...	...	−2·15	+0·27	...	−0·15	−0·22	...	...
+0·19	− 0·90	+0·17	+0·43	...	...	...	+0·27	−0·48	−0·58	...	...	...	...
−0·98	− 3·89	+0·03	+0·07	−0·86	+0·08	−0·25	−1·70	−0·81	−0·30	−0·18	−0·49	+0·05	−1·30
−2·28	− 2·73	+0·04	...	...	+0·02	...	−2·57	−0·06	0·00	...	...	−0·09	−1·51
−2·37	− 3·18	−0·41	...	−1·79	−1·18	...	+0·42	−0·78	−0·03	...	+0·12	0·00	...
−2·58	− 1·32	−1·03	...	−1·14	−0·57	...	...	...	...	...	...	...	...
−2·08	− 1·24	0·00	...	−0·28	−0·09	...	−2·01	−1·53	−0·31	...	−0·12	−0·07	...

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SOLUTION B.—NORMAL EQUATIONS RESULTING FROM

NORMALS

Group.	Coefficients of			Absolute Term.	Coefficients of μ'	Coefficients of the undermentioned						
	$\Delta x''$	$\Delta y''$	z			ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g
II.	+12·97	− 3·26	+ 4·85	+ 1·09	− 4·85	+ 0·12	+ 0·41	+0·11	+0·03	+0·29	+0·05	...
III.	+18·31	+ 2·40	+ 8·61	+ 0·94	−13·20	+ 0·95	+ 0·52	+0·60	+0·17	+1·00	+0·43	...
IV.	+18·70	−14·96	+ 0·10	− 0·71	+ 2·82	+ 0·16	− 0·09	+0·05	...	−0·25	−0·01	−0·01
V.	+ 8·35	+ 1·89	+ 3·74	− 0·41	+ 5·70	− 1·40	...	+0·03	...	...	+0·01	...
VI.	+ 8·86	− 4·07	− 2·45	− 0·16	+ 1·67	− 0·02	...	...	...	+0·36	+0·06	...
VII.	+12·31	+ 0·52	+ 1·61	− 0·26	− 8·89	...	− 0·98	...	...	...	...	...
VIII.	+12·47	− 3·59	− 1·72	+ 1·34	− 7·92	...	...	...	...	...	...	...
IX.	+17·88	+ 6·42	+ 0·15	+ 1·20	− 8·80	− 1·02	− 0·50	+0·49	−0·09	+0·25	...	...
X.	+ 6·54	+ 1·06	+ 1·28	− 0·18	− 0·72	...	...	...		...	...	...
XI.	+47·28	+ 5·99	+ 7·25	− 0·64	+29·63	− 1·82	+ 0·11	−0·04	−0·01	+1·08	−0·13	...
XII.	+11·36	− 2·72	− 2·91	− 0·29	+ 2·88	...	...	...	...	...	...	...
XIII.	+24·83	− 8·72	+ 1·87	+ 1·81	−10·31	+ 0·19	− 1·55	+0·10	...	+0·44	...	...
XIV.	+15·58	+ 7·20	+ 2·06	+ 0·61	− 8·76	− 0·59	− 0·47	−0·21	...	−0·10	−0·17	...
XV.	+ 9·34	+ 0·27	− 2·90	− 0·04	+ 3·33	...	...	...	...	...	...	...

NORMALS

II.	− 3·26	+14·89	+ 3·35	− 0·62	+ 2·91	− 0·17	− 0·54	−0·15	−0·05	−0·41	−0·06	...
III.	+ 2·40	+27·07	+ 1·10	− 0·18	+ 3·94	− 0·51	− 0·25	−0·30	−0·08	−0·54	−0·22	...
IV.	−14·96	+49·53	+15·19	+ 2·12	− 8·58	+ 0·12	− 0·09	−0·21	...	+0·26	+0·02	+0·01
V.	+ 1·89	+17·22	+ 3·14	+ 0·41	+ 1·75	− 0·05	...	−0·08	...	...	−0·02	...
VI.	− 4·07	+11·42	− 1·93	− 0·56	+ 1·45	+ 0·04	...	...	...	+0·51	+0·34	...
VII.	+ 0·52	+29·73	+ 7·22	− 0·63	− 1·31	...	+ 0·01	...	...	...	...	...
VIII.	− 3·59	+18·83	+ 1·75	− 0·01	+ 0·11	...	...	...	...	...	...	...
IX.	+ 6·42	+26·17	+ 9·79	+ 1·54	− 8·98	+ 0·24	− 0·53	−0·22	+0·03	−0·07	...	...
X.	+ 1·06	+10·85	+ 4·71	− 0·07	− 3·59	...	...	...	...	...	...	...
XI.	+ 5·99	+42·02	+11·41	+ 0·50	+ 0·77	+ 0·31	− 0·83	−0·06	+0·01	+1·57	+ 0·19	...
XII.	− 2·72	+27·33	+ 8·10	− 0·70	+ 5·08	...	...	...	...	...	...	...
XIII.	− 8·72	+33·09	+10·88	− 0·73	+ 7·12	+ 0·21	− 0·87	+0·10	...	+0·37	...	...
XIV.	+ 7·20	+18·89	− 0·59	+ 0·24	− 6·02	− 1·03	+ 1·14	−0·05	...	+0·21	− 0·36	...
XV.	+ 0·27	+14·18	+ 6·17	+ 0·43	− 3·89	...	...	...	...	...	...	...

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ALL THE OBSERVATIONS EXCLUDING SINGLE DISTANCES.

IN $\Delta x''$

symbolical corrections in terms of which $\Delta x''$, $\Delta y''$ and z are to be found.

a	g	e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'
−1·43	−1·85	−0·51	−0·24	−1·85	−0·22	...	+0·47	+0·14	...	...	+0·09	...	...
−1·73	−2·27	−0·76	−0·20	−2·26	−0·66	...	+0·86	+1·23	+0·20	+0·24	−0·95	−0·02	...
−4·61	−5·79	−1·68	...	−4·05	−0·49	−0·67	...	...	...	...	...	...	...
−4·95	...	−0·36	...	...	−0·24	...	...	+0·03	−0·12	−0·03	−0·01	...	...
−1·31	...	...	...	−1·31	−0·61	...	...	−0·96	−1·11	+0·29	−0·59	−0·35	−1·23
−2·20	−4·06	...	...	...	...	...	−1·04	−1·28	−0·75	−0·27	...	...	+0·01
...	...	...	...	...	...	...	−4·85	−2·00	−1·35	−0·42	−0·66	...	−0·88
−5·10	−3·11	−1·51	−0·58	−0·72	...	...	−0·66	−1·54	...	−0·04	−0·06	...	...
...	...	...	...	...	...	...	−3·46	−1·05	−0·75	...	...	...	...
−4·03	−2·60	−0·12	−0·05	−1·73	−0·20	...	−8·61	−5·37	−0·76	−0·25	−1·74	−0·20	−3·54
...	...	...	...	...	...	...	−2·96	−1·00	−1·05	...	...	−0·14	−0·94
−2·78	−1·80	−0·47	...	−0·56	...	...	−0·35	−1·37	−0·01	...	−0·15	−0·01	...
−1·50	−0·81	−0·27	...	−0·93	−0·11	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	+1·04	−0·29	−0·10	...	+0·23	+0·05	...

IN $\Delta y''$

+2·17	+2·47	+0·68	+0·35	+2·63	+0·30	...	+0·31	+0·09	...	...	+0·06	...	...
+0·93	+1·14	+0·38	+0·10	+1·20	+0·34	...	+1·61	+2·87	+2·04	+0·50	+0·91	+0·38	...
+8·02	+11·95	+2·96	...	+4·79	+0·60	+0·84	...	...	...	...	...	...	...
+2·67	...	+1·05	...	...	+0·64	...	...	+0·07	−0·20	−0·06	−0·01	...	...
+2·73	...	...	...	+0·10	+0·45	...	...	+0·52	+0·66	−0·13	+1·44	+0·59	−0·59
−0·04	+0·04	...	...	...	...	...	+2·84	−0·54	+0·37	+0·17	...	...	+0·18
...	...	...	...	...	...	...	+1·52	+1·85	+0·24	+0·18	+0·62	...	−0·06
−0·06	−1·45	−0·21	−0·07	+0·20	...	...	−2·15	+0·27	...	−0·15	−0·22	...	...
...	...	...	...	...	...	...	+0·27	−0·48	−0·58	...	...	...	...
−0·35	−3·89	+0·03	+0·07	−0·43	+0·29	...	−1·70	−0·81	−0·30	−0·18	−0·49	+0·05	−1·30
...	...	...	...	...	...	...	−2·57	−0·06	0·00	...	...	−0·09	−1·51
−1·92	−1·01	−0·34	...	−0·46	...	...	+0·42	−0·78	−0·03	...	+0·12	0·00	...
−1·57	−1·32	−1·03	...	−0·97	−0·45	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	−2·01	−1·53	−0·31	...	−0·12	−0·07	...

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SOLUTION A.—VALUES OF $\Delta x''$ AND $\Delta y''$

VALUES

Group.	Apparent Weight.	Uncorrected values.	Coefficients of μ'	Coefficients of the undermentioned								
				ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g	a	g
II.	12·26	+0·078	−0·344	+ ·007	+ ·024	+ ·007	+ ·002	+ ·016	+ ·002	...	− ·077	− ·107
III.	28·46	+ ·039	− ·682	+ ·001	+ ·137	+ ·033	+ ·013	+ ·017	+ ·044	...	− ·082	− ·162
IV.	14·18	− ·005	+ ·016	+ ·015	− ·008	− ·001	...	− ·012	·000	− ·001	− ·154	− ·154
V.	14·37	+ ·038	+ ·686	− ·097	+ ·347	− ·028	− ·023	− ·119	+ ·001	...	− ·336	− ·216
VI.	13·63	− ·001	+ ·321	+ ·520	...	− ·022	...	+ ·024	+ ·053	...	− ·263	..
VII.	27·76	+ ·032	− ·738	− ·212	− ·211	− ·046	− ·070	.	...	− ·065	− ·261	− ·311
VIII.	31·82	+ ·097	− ·699	+ ·042	+ ·416	− ·012	+ ·024	...	...	+ ·014	− ·215	− ·172
IX.	16·31	+ ·054	− ·405	− ·066	− ·023	+ ·033	− ·006	+ ·017	...	...	− ·312	− ·168
X.	23·50	+ ·027	− ·010	+ ·094	− ·125	+ ·029	+ ·073	...	...	...	− ·252	− ·255
XI.	46·46	− ·015	+ ·635	− ·040	+ ·005	− ·001	·000	+ ·025	− ·002	·000	− ·086	− ·043
XII.	37·95	− ·105	+ ·289	+ ·521	+ ·202	·000	...	...	+ ·038	...	− ·204	− ·126
XIII.	38·82	+ ·060	− ·499	− ·135	− ·123	− ·014	...	− ·025	− ·042	...	− ·096	− ·101
XIV.	19·03	+ ·051	− ·429	− ·315	− ·030	− ·011	...	− ·055	− ·041	...	− ·061	− ·036
XV.	30 96	− 023	+ ·190	− ·761	− ·560	− ·009	...	− ·044	− ·035	...	+ ·066	+ ·014

VALUES

II.	14 07	−0·025	+0·120	− ·010	− ·031	− ·009	− ·003	− ·024	− ·004	...	+ ·129	+ ·142
III.	35·00	− ·018	− ·102	+ ·063	− ·092	− ·010	·000	+ ·124	+ ·063	...	+ ·076	+ ·054
IV.	37·56	+ ·041	− ·168	+ ·007	− ·004	− ·005	...	+ ·002	·000	·000	+ ·115	+ ·194
V.	18·35	+ ·001	+ ·025	− ·007	− ·103	+ ·005	+ ·009	+ ·039	− ·001	...	+ 131	+ ·065
VI.	16·48	− ·030	+ ·251	+ ·417	...	− ·033	...	+ ·030	+ ·079	...	+ ·045	...
VII.	34·68	− ·010	+ ·026	− ·002	+ ·003	+ ·018	+ ·048	...	...	·000	− ·041	+ ·056
VIII.	30·05	− ·013	− ·162	+ ·218	+ ·291	+ ·070	+ ·068	...	...	+ ·039	+ ·003	− ·100
IX.	23·87	+ ·046	− ·244	+ ·026	− ·014	− ·017	+ ·003	− ·007	...	...	+ ·074	− ·014
X.	23·25	+ ·002	− ·223	− ·999	− ·458	− ·037	− ·069	...	...	..	+ ·022	− ·025
XI.	48·57	+ ·019	− ·069	+ ·121	− ·018	− ·001	·000	+ ·078	+ ·030	+ ·044	− ·007	− ·072
XII.	38·60	− ·043	+ ·200	+ ·053	+ ·077	− ·022	...	...	− ·024	...	− ·034	− ·054
XIII.	44·82	+ ·008	+ ·058	− ·062	+ ·040	− ·006	...	+ ·049	− ·020	...	− ·056	− ·075
XIV.	24·70	− ·013	− ·198	+ ·238	+ ·048	− ·001	...	+ ·055	+ ·021	...	− ·097	− ·049
XV.	29·39	+ ·011	− ·137	− ·230	− ·086	+ ·003	...	− ·088	− ·012	...	− ·072	− ·043

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FROM ALL THE OBSERVATIONS COMBINED.

OF $\Delta x''$

symbolical corrections in terms of which $\Delta x''$ and $\Delta y''$ are found.												z
e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'	
− ·029	− ·013	− ·103	− ·012	...	+ ·044	+ ·013	...	...	+ ·008	...	...	− ·455
− ·037	− ·016	− ·108	− ·015	...	+ ·025	+ ·034	+ ·001	+ ·007	− ·036	− ·002	...	− ·453
− ·056	...	− ·183	− ·022	− ·030	...	...	...	...	..	...	...	− ·331
− ·045	− ·051	− ·066	− ·015	...	...	+ ·002	− ·009	− ·002	− ·001	..	...	− ·392
− ·004	...	− ·096	− ·055	...	...	− ·072	− ·083	+ ·022	− ·048	− ·028	− ·088	− ·126
− ·025	− ·032	...	...	− ·044	− ·035	− ·046	− ·027	− ·010	...	...	·000	+ ·023
− ·016	− ·003	...	...	− ·019	− ·157	− ·068	− ·043	− ·014	− ·023	...	− ·027	− ·189
− ·089	− ·034	− ·047	...	...	− ·008	− ·099	...	·000	− ·001	...	...	+ ·138
− ·006	− ·021	...	...	...	− ·147	− ·043	− ·031	...	...	...	...	− ·023
− ·003	− ·001	− ·037	− ·005	·000	− ·180	− ·113	− ·015	− ·005	− ·036	− ·005	− ·072	− ·114
− ·003	...	...	− ·008	...	− ·070	− ·026	− ·028	...	...	− ·003	− ·020	− ·003
− ·016	...	− ·049	− ·011	...	− ·008	− ·036	·000	...	− ·004	·000	...	− ·025
− ·009	...	− ·036	+ ·002	...	...	...	...	...	...	...	...	+ ·028
·000	...	− ·005	·000	...	+ ·036	− ·008	− ·003	..	+ ·00[illegible]	+ ·002	...	+ ·298

OF $\Delta y''$

+ ·039	+ ·021	+ ·154	+ ·017	...	+ ·031	+ ·009	...	...	+ ·006	...	...	− ·324
+ ·014	+ ·004	+ ·083	+ ·040	...	+ ·043	+ ·070	+ ·058	+ ·014	+ ·029	+ ·011	...	+ ·038
+ ·043	...	+ ·041	+ ·006	+ ·008	...	...	...	...	...	...	...	− ·406
+ ·063	+ ·016	+ ·022	+ ·034	...	...	+ ·004	− ·011	− ·003	− ·001	...	...	− ·143
− ·005	...	+ ·011	+ ·018	...	...	+ ·036	+ ·044	− ·009	+ ·090	+ ·037	− ·031	− ·110
+ ·006	+ ·013	...	...	·000	+ ·081	− ·017	+ ·010	+ ·005	...	...	+ ·005	− ·192
+ ·006	− ·007	...	...	− ·019	+ ·065	+ ·068	+ ·012	+ ·007	+ ·023	...	+ ·001	− ·171
+ ·014	+ ·006	+ ·019	...	...	− ·080	+ ·034	...	− ·006	− ·008	...	...	− ·408
+ ·008	+ ·020	...	...	...	+ ·020	− ·018	− ·023	...	...	...	...	− ·478
+ ·001	+ ·002	− ·012	+ ·002	− ·005	− ·007	+ ·001	− ·004	− ·003	− ·005	+ ·002	− ·015	− ·175
+ ·001	...	...	+ ·002	...	− ·057	+ ·002	+ ·003	...	...	− ·002	− ·036	− ·294
− ·010	...	− ·042	− ·027	...	+ ·009	− ·019	− ·001	...	+ ·002	...	...	− ·266
− ·040	...	− ·042	− ·023	...	...	...	...	...	...	...	...	− ·096
·000	...	− ·010	− ·003	...	− ·069	− ·052	− ·011	...	− ·004	− ·002	...	− ·335

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SOLUTION B.—VALUES OF $\Delta x''$ and $\Delta y''$ FROM ALL

VALUES

Group.	Apparent Weight.	Uncorrected values.	Coefficients of μ'	Coefficients of the undermentioned symbolical								
				ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g	a	g
II.	12·26	+ ·078	− ·344	+ ·007	+ ·024	+ ·007	+ ·002	+ ·016	+ ·002	...	− ·077	− ·107
III.	18·10	+ ·053	− ·709	+ ·055	+ ·030	+ ·035	+ ·010	+ ·058	+ ·025	...	− ·100	− ·131
IV.	14·18	− ·005	+ ·016	+ ·015	− ·008	− ·001	...	− ·012	·000	− ·001	− ·154	− ·154
V.	8·14	− ·057	+ ·678	− ·170	...	+ ·005	...	...	+ ·001	...	− ·639	...
VI.	7·41	− ·049	+ ·296	− ·001	...	...	...	+ ·073	+ ·024	...	− ·046	...
VII.	12·30	− ·020	− ·721	...	− ·080	...	...	...	...	...	− ·179	− ·330
VIII.	11·79	+ ·114	− ·670	...	...	...	...	...	...	...	...	...
IX.	16·31	+ ·054	− ·405	− ·066	− ·023	+ ·033	− ·006	+ ·017	...	...	− ·312	− ·168
X.	6·44	− ·026	− ·057	...	...	...	...	...	...	...	...	...
XI.	46·42	− ·015	+ ·635	− ·040	+ ·005	− ·001	·000	+ ·018	− ·003	...	− ·086	− ·044
XII.	11·09	− ·032	+ ·306	...	...	...	...	...	...	...	...	...
XIII.	22·53	+ ·072	− ·374	+ ·011	− ·079	+ ·006	...	+ ·024	...	...	− ·145	− ·092
XIV.	12·84	+ ·041	− ·504	− ·016	− ·070	− ·015	...	− ·014	− ·002	...	− ·070	− ·024
XV.	9·33	− ·005	+ ·364	...	...	...	...	...	...	...	...	...

VALUES

Group.	Apparent Weight.	Uncorrected values.	Coefficients of μ'	ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g	a	g
II.	14·07	− ·025	+ ·120	− ·010	− ·031	− ·009	− ·003	− ·024	− ·004	...	+ ·129	+ ·142
III.	26·76	− ·011	− ·083	− ·024	− ·012	− ·014	− ·004	− ·025	− ·010	...	+ ·043	+ ·054
IV.	37·56	+ ·041	− ·168	+ ·007	− ·004	− ·005	...	+ ·002	·000	·000	+ ·115	+ ·194
V.	16·79	+ ·030	+ ·027	+ ·015	...	− ·005	...	...	− ·001	...	+ ·224	...
VI.	9·55	− ·066	+ ·233	+ ·003	..	...	...	+ ·070	+ ·038	...	+ ·222	...
VII.	29·71	− ·021	− ·032	...	+ ·002	...	...	...	...	...	+ ·002	+ ·007
VIII.	17·80	+ ·021	− ·122	...	...	...	...	...	...	...	...	...
IX.	23·87	+ ·046	− ·244	+ ·026	− ·014	− ·017	+ ·003	− ·007	...	...	+ ·074	− ·014
X.	10·68	− ·004	+ ·325	...	...	...	...	...	...	...	...	...
XI.	41·26	+ ·014	− ·072	+ ·013	− ·020	− ·001	·000	+ ·035	+ ·005	...	+ ·004	− ·086
XII.	26·68	− ·029	+ ·216	...	...	...	...	...	...	...	...	...
XIII.	30·03	− ·003	+ ·117	+ ·009	− ·047	+ ·005	...	+ ·017	...	...	− ·096	− ·054
XIV.	15·56	− ·003	− ·127	− ·049	+ ·087	+ ·003	...	+ ·017	− ·018	...	− ·056	− ·061
XV.	14·17	+ ·030	− ·282	...	...	...	...	...	...	...	...	...

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OBSERVATIONS, EXCLUDING SINGLE DISTANCES.

OF $\Delta x''$

corrections in terms of which $\Delta x''$, $\Delta y''$ and z are found.												z
e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'	
− ·029	− ·013	− ·103	− ·012	...	+ ·044	+ ·013	...	...	+ ·008	...	...	− ·455
− ·044	− ·012	− ·131	− ·038	...	+ ·040	+ ·053	+ ·001	+ ·011	− ·057	− ·003	...	− ·470
− ·056	...	− ·183	− ·022	− ·030	...	...	...	...	...	...	...	− ·331
− ·057	...	...	− ·038	...	...	+ ·002	− ·012	− ·002	− ·001	...	...	− ·417
...	...	− ·171	− ·061	...	...	− ·104	− ·119	+ ·032	− ·011	− ·019	− ·194	+ ·424
...	...	...	...	...	− ·089	− ·103	− ·062	− ·022	...	...	+ ·001	− ·120
...	...	...	...	...	− ·387	− ·140	− ·110	− ·033	− ·046	...	− ·075	+ ·118
− ·089	− ·034	− ·047	...	...	− ·008	− ·099	...	·000	− ·001	...	...	+ ·138
...	...	...	...	...	− ·541	− ·155	− ·107	...	...	...	...	− ·127
− ·003	− ·001	− ·036	− ·005	...	− ·180	− ·113	− ·015	− ·005	− ·036	− ·005	− ·072	− ·121
...	...	...	...	...	− ·290	− ·091	− ·095	...	...	− ·014	− ·098	+ ·189
− ·025	...	− ·030	...	...	− ·011	− ·070	− ·001	...	− ·005	·000	...	− ·210
+ ·009	...	− ·044	+ ·005	...	...	...	...	...	...	...	...	− ·178
...	...	...	...	...	+ ·116	− ·028	− ·010	...	+ ·025	+ ·005	...	+ ·323

OF $\Delta y''$

+ ·039	+ ·021	+ ·154	+ ·017	...	+ ·031	+ ·009	...	...	+ ·006	...	...	− ·324
+ ·018	+ ·005	+ ·056	+ ·016	...	+ ·056	+ ·101	+ ·075	+ ·018	+ ·039	+ ·014	...	+ ·001
+ ·043	...	+ ·041	+ ·006	+ ·008	...	...	...	...	...	...	...	− ·406
+ ·067	...	...	+ ·041	...	...	+ ·004	− ·010	− ·003	− ·001	...	...	− ·136
...	...	− ·052	+ ·018	...	...	+ ·008	+ ·016	·000	+ ·122	+ ·045	− ·120	+ ·320
...	...	...	...	...	+ ·097	− ·017	+ ·013	+ ·006	...	...	+ ·006	− ·241
...	...	...	...	...	+ ·007	+ ·071	− ·008	+ ·003	+ ·024	...	− ·017	− ·070
+ ·014	+ ·006	+ ·019	...	...	− ·080	+ ·034	...	− ·006	− ·008	...	...	− ·408
...	...	...	...	...	+ ·077	− ·029	− ·043	...	...	...	...	− ·421
+ ·001	+ ·002	− ·005	+ ·008	...	− ·015	− ·003	− ·005	− ·004	− ·007	+ ·002	− ·021	− ·254
...	...	...	...	...	− ·123	− ·011	− ·009	...	...	− ·005	− ·065	− ·278
− ·017	...	− ·022	...	...	+ ·010	− ·042	− ·001	...	+ ·002	·000	...	− ·384
− ·058	...	− ·035	− ·026	...	...	...	...	...	...	...	...	+ ·099
...	...	...	...	...	− ·144	− ·107	− ·022	...	− ·009	− ·005	...	− ·441

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The determination of z is deferred until the definitive values of the symbolical corrections, as well as the definitive corrections of the tabular motion, have been determined.

The development of the residual corrections of the Ephemeris is restricted to terms depending on the 3rd power of the time in accordance with the conclusions of Chapter V. (p. 471).

The *true* weights of the values of $\Delta x''$ and $\Delta y''$ as derived from each group are not the *apparent* weights resulting from the solution of the Normals. The weight of each separate equation is based on the mean absolute error of the class of observations to which it belongs. This mean error depends not only on the mean accidental error of the Heliometer observations but also on the mean error of the place of the star of reference. The *apparent* weights of $\Delta x''$ and $\Delta y''$ derived from the normal equations of any group would therefore only be the *true* weights of these unknowns provided that in each set the derived position of the planet depended upon a different reference star. But in such groups as VIII., X., or XV. there are a large number of sets of observations which are all referred to one and the same star; consequently, whatever may be the error of the star's place, the whole of that error enters into the determination of $\Delta x''$ and $\Delta y''$. On the other hand, in such a group as IV., where no less than 10 different comparison stars enter into the determination of $\Delta x''$ and $\Delta y''$, the effect of the error of the star-places is to a great extent eliminated, although not so completely as if each equation were based on a different star of comparison. Thus, in all cases, the *apparent* weights of the value of $\Delta x''$ and $\Delta y''$ for each group should be higher than their *true* weights.

In the following equations for the determination of , β, γ, δ, μ', &c., both the *apparent* and the *true* weights are given. The method by which the *true* weights are computed is more conveniently given in connection with the definitive determination of the parallax and the final results. The small symbolical terms ΔA, a, a', &c., are for the present neglected.

EXPRESSIONS FOR $\Delta x''$.

Group.	Coefficients of μ' in solution B.	Coefficients of					From all observations.	From all except single distances.	Apparent weights.		True weights.	
		$\Delta\alpha$	$\Delta\beta$	$\Delta\gamma$	$\Delta\delta$	μ'	$\Delta x''_A$	$\Delta x''_B$	p_{x_A}	p_{x_B}	P_{x_A}	P_{x_B}
A.	−0·58	+1·02	−4·08	+16·34	−6·54	−0·58	−0·101	−0·101	2·57	2·57	2·5	2·5
I.	−0·57	+1·04	−3·86	+14·28	−5·28	−0·57	+ ·354	+ ·354	2·49	2·49	2·4	2·4
II.	+0·34	+1·08	−3·36	+10·42	−3·23	+0·34	+ ·078	+ ·078	12·26	12·26	11·6	11·6
III.	+0·71	+1·12	−2·91	+ 7·56	−1·96	+0·68	+ ·039	+ ·053	28·46	18·10	17·8	14·2
IV.	−0·02	+1·16	−2·20	+ 4·18	−0·80	−0·02	− ·005	− ·005	14·18	14·18	13·5	13·5
V.	−0·68	+1·19	−1·42	+ 1·71	−0·20	−0·69	+ ·038	− ·057	14·37	8·14	13·7	8·1

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Expressions for $\Delta x''$—*continued.*

Group.	Coefficients of μ' in solution B.	Coefficients of					From all observations.	From all except single distances.	Apparent weights.		True weights.	
		$\Delta\alpha$	$\Delta\beta$	$\Delta\gamma$	$\Delta\delta$	μ'	$\Delta x''_A$	$\Delta x''_B$	p_{x_A}	p_{x_B}	P_{x_A}	P_{x_B}
							″	″				
VI.	−0·30	+1·20	−0·84	+ 0·59	−0·04	−0·32	−0·001	−0·049	13·63	7·41	12·8	8·1
VII.	+0·72	+1·21	0·00	0·00	0·00	+0·74	+ ·032	− ·020	27·76	12·30	22·8	14·2
VIII.	+0·67	+1·21	+0·42	+ 0·15	0·00	+0·70	+ ·097	+ ·114	31·82	11·79	19·7	10·2
IX.	+0·41	+1·20	+0·72	+ 0·43	+0·02	+0·41	+ ·054	+ ·054	16·31	16·31	20·4	20·4
X.	+0·06	+1·20	+0·96	+ 0·77	+0·06	+0·01	+ ·027	− ·026	23·50	6·44	17·4	6·5
XI.	−0·64	+1·18	+1·65	+ 2·31	+0·32	−0·64	− ·015	− ·015	46·46	46·42	42·2	40·0
XII.	−0·31	+1·15	+2·31	+ 4·62	+0·93	−0·29	− ·105	− ·032	37·95	11·09	22·4	8·7
XIII.	+0·37	+1·12	+2·92	+ 7·59	+1·97	+0·50	+ ·060	+ ·072	38·82	22·53	23·3	20·0
XIV.	+0·50	+1·08	+3·47	+11·10	+3·55	+0·43	+ ·051	+ ·041	19·03	12·84	16·8	12·8
XV.	−0·36	+1·05	+3·89	+14·37	+5·32	−0·19	− ·023	− ·005	30·96	9·33	13·2	7·0

Expressions for $\Delta y''$.

Group.	Coefficients of μ' in solution B.	Coefficients of					From all observations.	From all except single distances.	Apparent weights.		True weights.	
		$\Delta\alpha'$	$\Delta\beta'$	$\Delta\gamma'$	$\Delta\delta'$	μ'	$\Delta y''_A$	$\Delta y''_B$	p_{y_A}	p_{y_B}	P_{y_A}	P_{y_B}
							″	″				
A.	−0·01	+1·02	−4·08	+16·34	−6·54	−0·01	−0·164	−0·164	1·77	1·77	1·7	1·7
I.	−0·11	+1·04	−3·86	+14·28	−5·28	−0·11	− ·041	− ·041	1·97	1·97	1·9	1·9
II.	−0·12	+1·08	−3·36	+10·42	−3·23	−0·12	− ·025	− ·025	14·07	14·07	12·7	12·7
III.	+0·08	+1·12	−2·91	+ 7·56	−1·96	+0·10	− ·018	− ·011	35·00	26·76	19·5	18·0
IV.	+0·17	+1·16	−2·20	+ 4·18	−0·80	+0·17	+ ·041	+ ·041	37·56	37·56	35·1	35·1
V.	−0·03	+1·19	−1·42	+ 1·71	−0·20	−0·03	+ ·001	+ ·030	18·35	16·79	16·0	15·8
VI.	−0·23	+1·20	−0·84	+ 0·59	−0·04	−0·25	− ·030	− ·066	16·48	9·55	13·9	9·8
VII.	+0·03	+1·21	0·00	0·00	0·00	−0·03	− ·010	− ·021	34·68	29·71	22·7	21·7
VIII.	+0·12	+1·21	+0·42	+ 0·15	0·00	+0·16	− ·013	+ ·021	30·05	17·80	14·2	11·0
IX.	+0·24	+1·20	+0·72	+ 0·43	+0·02	+0·24	+ ·046	+ ·046	23·87	23·87	25·1	25·1
X.	+0·33	+1·20	+0·96	+ 0·77	+0·06	+0·22	+ ·002	− ·004	23·25	10·68	14·3	8·8
XI.	+0·07	+1·18	+1·65	+ 2·31	+0·32	+0·07	+ ·019	+ ·014	48·57	41·26	38·6	36·2
XII.	−0·22	+1·15	+2·31	+ 4·62	+0·93	−0·20	− ·043	− ·029	38·60	26·68	21·4	16·6
XIII.	−0·12	+1·12	+2·92	+ 7·59	+1·97	−0·06	+ ·008	− ·003	44·82	30·03	24·1	22·4
XIV.	+0·13	+1·08	+3·47	+11·10	+3·55	+0·20	− ·013	− ·003	24·70	15·56	21·9	16·9
XV.	+0·28	+1·05	+3·89	+14·37	+5·32	+0·14	+ ·011	+ ·030	29·39	14·17	15·4	10·2

NOTE.—There are several apparent anomalies where the *true* weights exceed the *apparent* weights. In such cases several comparison stars have been employed whose places were determined in the Triangulation with exceptional accuracy. In assigning the original weights of the equations all the star places were regarded as of equal weight. In the computation of the *true* weights the actual mean error of each star and its effect on each value of $\Delta x''$ and $\Delta y''$ has been regarded.

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Having regard to the *true* weights, the Normal Equations are :—

Solution A.

365·6	$\Delta\alpha$	+ 190·0	$\Delta\beta$	+ 1321·0	$\Delta\gamma$	+ 105·6	$\Delta\delta$	+ 23·8	μ'	=	+	6·737
190·0		+ 1326·1		+ 1055·2		+ 1057·5		− 19·1		=	−	6·464
1321·0		+ 1055·2		+ 10571·0		+ 998·2		+ 117·1		=	+	27·908
105·6		+ 1057·5		+ 998·2		+ 1071·9		+ 2·4		=	−	5·325
23·8		+ 19·1		+ 117·1		+ 2·4		+ 74·2		=	+	4·661
399·5	$\Delta\alpha'$	+ 145·6	$\Delta\beta'$	+ 1524·1	$\Delta\gamma'$	+ 117·0	$\Delta\delta'$	+ 18·7	μ'	=	+	0·896
145·6		+ 1527·8		+ 1173·3		+ 1195·3		+ 11·7		=	+	0·788
1524·1		+ 1173·3		+ 11931·7		+ 1359·9		+ 72·2		=	−	7·197
117·0		+ 1195·3		+ 1359·9		+ 1185·3		+ 17·8		=	+	2·493
18·7		+ 11·7		+ 72·2		+ 17·8		+ 6·8		=	+	0·797

Solution B.

269·1	$\Delta\alpha$	+ 108·8	$\Delta\beta$	+ 1021·1	$\Delta\gamma$	+ 42·1	$\Delta\delta$	+ 14·1	μ'	=	+	4·645
108·8		+ 1023·1		+ 415·2		+ 808·1		− 25·6		=	−	0·983
1021·1		+ 415·2		+ 8070·4		+ 310·4		+ 89·5		=	+	35·945
42·1		+ 808·1		+ 310·4		+ 806·8		− 1·5		=	−	3·012
14·1		− 25·6		+ 89·5		− 1·5		+ 54·1		=	+	3·247
351·5	$\Delta\alpha'$	+ 85·5	$\Delta\beta'$	+ 1308·8	$\Delta\gamma'$	+ 61·8	$\Delta\delta'$	+ 16·9	μ'	=	+	1·833
85·5		+ 1317·0		+ 624·4		+ 993·1		+ 4·9		=	+	1·229
1308·8		+ 624·4		+ 9926·8		+ 738·0		+ 49·9		=	−	1·201
61·8		+ 993·1		+ 738·0		+ 956·2		+ 13·7		=	+	3·482
16·9		+ 4·9		+ 49·9		+ 13·7		+ 6·8		=	+	0·920

In solving these Normals μ' was first eliminated with its weight from the Normals in α, β, γ δ and μ' and also independently from the Normals in α', β', γ', δ' and μ'. The two values of μ' were then combined having regard to their weights, and the remaining Normals from which μ' had been eliminated were then solved for the other unknowns :—

	Solution A.		Solution B.		Mean $\frac{A+B}{2}$
					Mean Error
With the mean of A and B and these mean weights	μ' = + 0·05984	Wt 75·5	+ 0·06678	Wt 54·9	+ 0·06331 ± 0·016
	$\Delta\alpha$ = + ·01443	179·2	− ·00702	126·5	+ ·00371
	$\Delta\beta$ = − ·00433	252·4	+ ·01700	191·9	+ ·00634
$[pvv] = 0·3492$	$\Delta\gamma$ = + ·00090	5239·8	+ ·00458	4058·3	+ ·00274
	$\Delta\delta$ = − ·00308	204·9	− ·02205	155·7	− ·01257
	$\Delta\alpha'$ = + ·00868	192·5	+ ·00980	171·7	+ ·00924
$\frac{[pvv]}{n-9} = 0·0166$	$\Delta\beta'$ = − ·00650	304·1	− ·00797	274·2	− ·00724
	$\Delta\gamma'$ = − ·00256	5116·7	− ·00214	4611·0	− ·00235
	$\Delta\delta'$ = + ·00984	218·4	+ ·01198	191·8	+ ·01091

Since the mean values of the corrections ΔA, ΔG, &c. (which occur with considerable coefficients in the single distances) are not yet definitively determined, and since the amount of "crossing through" (κ) is probably not rigorously the same for any observer in all circumstances of definition and of distance, there still remains

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with the single distances the possible liability to small systematic error. On this account it seems desirable to take the means of the values of $\Delta\alpha$, $\Delta\beta$, &c., $\Delta\alpha'$, $\Delta\beta'$, &c., and of μ' as found from Solutions A and B,—a process which is equivalent to giving half weight to the observations of single distances. In this way the following comparison between the observed and computed results is obtained :—

Mean Epoch.		Group.	Corrections in $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$ and $\Delta\delta$.	Corrections in μ'.	Computed Value of $\Delta x''$.	Observed Value of $\Delta x''$.	O–C.	Weight.
			″	″	″	″	″	
June	8	$\frac{A+I.}{2}$	+0·095	—0·036	+0·059	+0·126	+0·067	4·9
	17	II.	+ ·052	+ ·021	+ ·073	+ ·078	+ ·004	11·6
	22	III.	+ ·031	+ ·044	+ ·075	+ ·046	— ·029	16·0
	29	IV.	+ ·012	— ·001	+ ·011	— ·005	— ·016	13·5
July	6	V.	+ ·002	— ·043	— ·040	— ·009	+ ·031	11·0
	11	VI.	+ ·001	— ·020	— ·019	— ·025	— ·006	10·5
	18	VII.	+ ·004	+ ·046	+ ·050	+ ·006	— ·044	18·5
	21·5	VIII.	+ ·008	+ ·043	+ ·051	+ ·105	+ ·054	15·0
	24	IX.	+ ·010	+ ·026	+ ·036	+ ·054	+ ·018	20·4
	26	X.	+ ·012	+ ·002	+ ·014	·000	— ·013	12·0
August	1	XI.	+ ·017	— ·040	— ·023	— ·015	+ ·008	41·1
	7	XII.	+ ·020	— ·019	+ ·001	— ·068	— ·069	15·6
	13	XIII.	+ ·019	+ ·027	+ ·046	+ ·066	+ ·019	21·7
	19	XIV.	+ ·012	+ ·029	+ ·041	+ ·046	+ ·005	14·8
	24	XV.	+ ·001	— ·017	— ·016	— ·014	+ ·002	10·1

Mean Epoch.		Group.	Corrections in $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma'$ and $\Delta\delta'$.	Corrections in μ'.	Computed Value of $\Delta y''$.	Observed Value of $\Delta y''$.	O–C.	Weight.
			″	″	″	″	″	
June	8	$\frac{A+I.}{2}$	—0·062	—0·004	—0·066	—0·102	—0·036	3·6
	17	II.	— ·025	— ·008	— ·033	— ·025	+ ·008	12·7
	22	III.	— ·008	+ ·006	— ·002	— ·014	— ·012	18·8
	29	IV.	+ ·008	+ ·011	+ ·019	+ ·041	+ ·022	35·1
July	6	V.	+ ·015	— ·002	+ ·013	+ ·015	+ ·002	15·9
	11	VI.	+ ·015	— ·015	·000	— ·048	— ·048	11·9
	18	VII.	+ ·011	·000	+ ·011	— ·015	— ·026	22·2
	21·5	VIII.	+ ·008	+ ·009	+ ·017	+ ·004	— ·013	12·6
	24	IX.	+ ·005	+ ·015	+ ·020	+ ·046	+ ·026	25·1
	26	X.	+ ·003	+ ·017	+ ·020	— ·001	— ·021	11·6
August	1	XI.	— ·003	+ ·004	+ ·001	+ ·016	+ ·015	37·4
	7	XII.	— ·007	— ·013	— ·020	— ·036	— ·016	19·0
	13	XIII.	— ·007	— ·006	— ·013	+ ·002	+ ·015	23·3
	19	XIV.	— ·002	+ ·010	+ ·008	— ·008	— ·016	19·4
	24	XV.	— ·006	+ ·013	+ ·008	+ ·020	+ ·012	12·8

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The values of $\Delta x''$ and $\Delta y''$, computed for each alternate day, and *including* the corrections of the terms depending on μ', are given in the following Table :—

VALUES OF $\Delta x''$ AND $\Delta y''$ INCLUDING CORRECTIONS DEPENDENT ON μ'.*

Date.	$\Delta x'' + \frac{l_x}{10}\mu'$	$y'' + {}^{l_y}\mu'$	Date.	$\Delta x'' + \frac{l_x}{10}\mu'$	$\Delta y'' + \frac{l_y}{10}\mu'$	Date.	$\Delta x'' + \frac{l_x}{10}\mu'$	$\Delta y'' + \frac{l_y}{10}\mu'$
1889	″	″	1889	″	″	1889	″	″
June 7	+ 0·079	− 0·077	July 5	− 0·041	+ 0·015	Aug. 2	− 0·029	− 0·005
9	+ ·060	− ·069	7	− ·044	+ ·009	4	− ·023	− ·013
11	+ ·050	− ·061	9	− ·036	+ ·005	6	− ·008	− ·018
13	+ ·050	− ·054	11	− ·018	+ ·001	8	+ ·010	− ·020
15	+ ·058	− ·045	13	+ ·006	+ ·000	10	+ ·032	− ·019
17	+ ·069	− ·033	15	+ ·029	+ ·004	12	+ ·051	− ·014
19	+ ·076	− ·021	17	+ ·048	+ ·009	14	+ ·062	− ·007
21	+ ·079	− ·009	19	+ ·054	+ ·013	16	+ ·060	·000
23	+ ·075	+ ·001	21	+ ·053	+ ·018	18	+ ·050	+ ·007
25	+ ·061	+ ·012	23	+ ·041	+ ·020	20	+ ·031	+ ·012
27	+ ·040	+ ·018	25	+ ·026	+ ·020	22	+ ·011	+ ·016
29	+ ·019	+ ·022	27	+ ·007	+ ·017	24	− ·012	+ ·017
July 1	− ·003	+ ·022	29	− ·011	+ ·012	26	− ·035	+ ·018
3	− ·025	+ ·019	31	− ·024	+ ·003	28	− ·050	+ ·018

When the values of $\Delta x''$ and $\Delta y''$ are interpolated from the above Table for the epoch of each equation, and the corresponding quantities have been substituted, we obtain the values of O–C which are given beside the weights in the columns marked v_1 pp. 476–489 ; since the term z has been shewn to be practically zero these figures may be regarded as the true residuals on the assumption that the personal terms ΔA, ΔG, &c., a, g, &c., a', g', &c. are insensible.

Having thus corrected the equations for the most probable errors of the Tabular motion of the planet, we may proceed to determine the definitive value of the parallax.

* It will be remarked that, apart from the terms depending on μ', these corrections are almost insignificant, except for the period previous to June 17, during which, in the preliminary solution, the corrections depend on extrapolation.

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Employing, therefore, the absolute terms v_1, just found, in lieu of the previous values of O–C, we first determine *de novo* the absolute terms of the Normals in $\Delta x''$ and $\Delta y''$ (pp. 492–495).

VALUES OF THE ABSOLUTE TERMS OF THE NORMAL EQUATIONS IN $\Delta' x''$ and $\Delta' y''$ (IN LIEU OF THOSE GIVEN AT PP. 492–495), OBTAINED WHEN THE DEFINITIVE CORRECTIONS FOR ERRORS OF THE EPHEMERIS HAVE BEEN APPLIED, THAT IS TO SAY, WHEN THE VALUES OF THE ABSOLUTE TERM IN COLUMN v_1 ARE EMPLOYED.

Group.	For Normals in $\Delta' x''$ †		For Normals in $\Delta' y''$ †	
	Solution A.	Solution B.	Solution A.	Solution B.
	″	″	″	″
II.	+ 0·09	+ 0·09	+ 0·04	+ 0·04
III.	− 1·02	− 0·43	− 0·75	− 0·29
IV.	− 0·65	− 0·65	+ 1·59	+ 1·59
V.	+ 1·14	− 0·10	− 0·28	+ 0·27
VI.	+ 0·22	− 0·01	− 0·45	− 0·62
VII.	− 0·50	− 0·88	− 0·76	− 1·05
VIII.	+ 1·28	+ 0·78	− 0·85	− 0·13
IX.	+ 0·49	+ 0·49	+ 0·76	+ 0·76
X.	+ 0·32	− 0·30	− 0·33	− 0·33
XI.	+ 0·55	+ 0·47	+ 0·83	+ 0·50
XII.	− 4·18	− 0·32	− 1·36	− 0·07
XIII.	+ 0·36	+ 0·62	+ 0·82	+ 0·10
XIV.	+ 0·20	− 0·12	− 0·58	− 0·19
XV.	− 0·39	+ 0·23	− 0·17	+ 0·08

The symbolic terms expressing the personal corrections of course remain identical with those given in the Normal Equations at pp. 492–495; but as the value of μ' (viz. + 0·063—*see* p. 504) has been substituted throughout, we must write $\Delta\mu'$ for μ in the new Normals.

† It is convenient to write $\Delta' x''$ and $\Delta' y''$ for $\Delta x''$ and $\Delta y''$ when the absolute terms are taken from column v_1.

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The Normals in z, having regard to the weights, and using the absolute terms in column v_1, are—

SOLUTION A.

NORMALS

Group.	Co-efficients of			Absolute Term.	Co-efficients of $\Delta\mu'$	Co-efficients of the undermentioned						
	$\Delta' x''$	$\Delta' y''$	z			ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g
II.	+ 4·85	+ 3·35	+14·55	+ 0·13	− 1·27	− 0·15	− 0·49	+0·15	+0·05	+0·42	+0·06	...
III.	+12·92	+ 0·05	+23·47	+ 0·06	− 8·55	+ 1·95	− 0·57	+0·44	−0·13	−3·83	−1·48	...
IV.	+ 0·10	+15·19	+33·88	+ 2·87	− 5·25	+ 0·01	+ 0·02	+0·18	...	−0·30	−0·02	−0·01
V.	+ 5·53	+ 2·32	+11·54	+ 0·24	+ 3·49	− 0·71	+ 0·50	−0·11	−0·53	−1·12	+0·02	...
VI.	+ 1·81	+ 1·93	+17·99	+ 0·78	+ 1·67	+ 8·38	...	+0·45	...	−0·57	−1·40	...
VII.	− 0·81	+ 6·68	+25·66	− 0·66	+ 0·02	− 3·88	+ 3·27	−0·72	−1·64	...	...	+0·49
VIII.	+ 6·54	+ 5·72	+28·35	+ 1·07	− 5·56	+ 5·26	+ 9·49	−1·80	−1·27	...	...	−1·79
IX.	+ 0·15	+ 9·79	+16·78	− 0·61	− 2·47	+ 0·82	− 1·07	+0·38	−0·05	+0·15	...	...
X.	+ 1·17	+11·17	+18·32	+ 0·47	− 2·76	−17·74	− 3·47	+0·42	+1·72	...	...	...
XI.	+ 6·74	+ 9·55	+42·60	− 0·68	+ 1·73	+ 1·23	− 0·55	+0·05	−0·01	−0·23	−1·34	−1·92
XII.	+ 1·50	+11·54	+31·41	− 0·58	+ 4·86	+ 3·17	+ 7·32	+0·81	...	...	+0·41	...
XIII.	+ 0·51	+11·90	+32·06	+ 0·57	+ 1·45	+ 3·24	− 0·96	+0·01	...	−1·37	+1·23	...
XIV.	− 0·31	+ 2·34	+20·39	− 0·37	− 0·87	+ 4·85	+ 0·90	+0·07	...	−1·22	−0·33	...
XV.	− 8·97	+ 9·61	+16·83	− 0·88	− 3·78	+ 3·14	+ 2·65	+0·04	...	+2·39	+0·63	...

SOLUTION B.

II.	+ 4·85	+ 3·35	+14·55	+ 0·13	− 1·27	− 0·15	− 0·49	+0·15	+0·05	+0·42	+0·06	...
III.	+ 8·61	+ 1·10	+15·78	+ 0·39	− 6·30	+ 0·24	− 0·62	+0·46	+0·10	+0·69	+0·21	...
IV.	+ 0·10	+15·19	+33·88	+ 2·87	− 5·25	+ 0·01	+ 0·02	+0·18	...	−0·30	−0·02	−0·01
V.	+ 3·74	+ 3·14	+10·56	− 0·24	+ 2·30	− 0·71	...	+0·07	...	..	+0·02	...
VI.	− 2·45	− 1·93	+11·72	+ 0·22	− 0·96	+ 0·04	...	...	...	−0·57	−0·37	...
VII.	+ 1·61	+ 7·22	+19·41	− 0·58	− 1·84	...	− 0·68	...	...	...	...	...
VIII.	− 1·72	+ 1·75	+14·08	+ 0·41	+ 0·97	...	...	...	...	...	...	...
IX.	+ 0·15	+ 9·79	+16·78	− 0·61	− 2·47	+ 0·82	− 1·07	+0·38	−0·05	+0·15	...	...
X.	+ 1·28	+ 4·71	+ 6·38	− 0·51	− 1·57	...	...	...	...	...	...	...
XI.	+ 7·25	+11·41	+38·93	− 0·28	+ 1·95	− 1·10	− 0·55	+0·05	−0·01	+1·82	−0·19	...
XII.	− 2·91	+ 8·10	+16·30	− 0·64	+ 1·76	...	...	...	...	...	...	...
XIII.	+ 1·87	+10·88	+22·71	+ 0·40	+ 0·42	+ 0·90	− 1·37	−0·03	...	−0·40	...	...
XIV.	+ 2·06	− 0·59	+15·31	+ 0·07	− 0·86	− 0·82	+ 0·90	+0·07	...	−0·18	+0·35	...
XV.	− 2·90	+ 6·17	+ 7·37	− 0·51	− 2·95	...	...	...	...	...	...	...

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IN z.

symbolical corrections in terms of which z is to be found

a	g	e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'
+1·73	+ 2·22	−0·69	−0·33	−2·68	−0·27	...	+0·38	+0·11	...	...	−0·05	...	...
+0·51	− 0·74	−0·67	−0·10	−2·99	−1·02	...	+1·28	+1·51	−1·37	−0·35	−1·04	−0·33	...
+5·40	+10·38	−2·80	...	−5·30	−0·68	−0·72	...	...	...	...	...	...	...
−0·42	− 0·31	−1·02	−0·48	−0·62	−0·64	...	...	+0·05	+0·12	+0·04	+0·01	...	...
−0·08	...	+0·07	...	+0·03	−0·11	...	...	+1·04	−0·44	+0·20	−1·44	−0·63	+0·70
+0·61	−6·01	−0·35	−0·36	...	...	+0·33	+2·30	−1·10	−0·20	−0·23	...	...	−0·16
−4·38	−1·77	−0·27	+0·13	...	...	+1·01	+1·41	+0·72	−0·05	−0·30	−0·71	...	+0·41
+2·11	−0·82	−0·02	0·00	−0·42	...	...	−0·72	−0·17	...	+0·10	+0·17	...	...
+3·69	−3·09	−0·09	−0·49	...	...	...	−1·05	−0·97	+0·67	...	...	...	...
−3·29	−3·19	0·00	−0·03	+0·99	−0·11	+0·22	−4·74	−0·67	+0·33	+0·23	+0·63	−0·04	+2·26
+0·51	−3·36	−0·02	...	...	+0·05	...	−3·11	+0·31	−0·14	...	...	+0·08	+1·57
−1·03	−3·68	+0·15	...	+1·95	+0·26	...	+0·16	−0·67	−0·01	...	−0·14	...	...
−2·21	−1·28	+0·90	...	+1·26	+0·52	...	...	...	...	...	...	...	...
−0·12	−0·63	0·00	...	+0·25	+0·06	...	−1·60	−0·88	+0·25	...	+0·03	+0·04	...

+1·73	+ 2·22	−0·69	−0·33	−2·68	−0·27	...	+0·38	+0·11	...	...	−0·05	...	...
−0·44	+ 0·32	−0·58	−0·11	−1·64	−0·32	...	+1·28	+1·51	−1·37	−0·35	−1·04	−0·33	...
+5·40	+10·38	−2·80	...	−5·30	−0·68	−0·72	...	...	...	...	...	...	...
−0·42	...	−0·89	...	...	−0·64	...	...	+0·05	+0·12	+0·04	+0·01	...	...
+2·43	...	...	...	+0·03	−0·11	...	...	+1·04	−0·44	+0·20	−1·44	−0·63	+0·70
+1·73	− 2·79	...	...	...	...	...	+2·30	−1·10	−0·20	−0·23	...	...	−0·16
...	...	...	...	...	...	...	+1·41	+0·72	−0·05	−0·30	−0·71	...	+0·41
+2·11	−0·82	−0·02	0·00	−0·42	...	...	−0·72	−0·17	...	+0·10	+0·17	...	...
...	...	..	...	...	...	...	−1·05	−0·97	+0·67	...	...	...	...
−3·02	−3·19	0·00	−0·03	+0·64	−0·29	...	−4·74	−0·67	+0·33	+0·23	+0·63	−0·04	+2·26
...	...	...	...	...	...	...	−3·11	+0·31	−0·14	...	...	+0·08	+1·57
−1·41	−1·59	+0·14	...	+0·50	...	...	+0·16	−0·67	−0·01	...	−0·14	0·00	...
−1·29	−1·28	+0·90	...	+1·10	+0·42	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	−1·60	−0·88	+0·25	...	+0·03	+0·04	...

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Eliminating $\Delta' x''$ and $\Delta' y''$ from the Normals of each group, having regard to the symmetry of the equations, the following values of z are obtained, together with their *apparent* weights.

SOLUTION A.—VALUES OF z IN TERMS

Group.	App. Weight.	z	Co-efficients of the undermentioned									
			$\Delta\mu'$	ΔA	ΔG	ΔE	ΔH	ΔP	ΔS	ΔH_g	a	g
I.	0·71	—0·067	—0·038	...	+·035	...	...	...	+·065	...	...	+·316
II.	11·26	+ ·007	— ·001	—·012	—·044	+·013	+·004	+·037	+·005	...	+·148	+·201
III.	17·61	+ ·028	+ ·015	+·110	—·131	+·001	—·017	—·230	—·116	...	+·089	+·076
IV.	27·67	+ ·088	— ·097	—·003	+·003	+·009	...	—·012	—·001	·000	+·132	+·269
V.	9·05	— ·019	— ·041	—·017	—·130	+·004	—·047	—·061	+·002	...	+·126	+·082
VI.	17·55	+ ·046	+ ·034	+·377	...	+·031	...	—·038	—·094	...	+·018	...
VII.	24·36	— ·021	— ·031	—·165	+·126	—·036	—·083	...	...	+·018	+·028	—·273
VIII.	26·14	+ ·037	— ·002	+·143	+·196	—·081	—·070	...	...	—·080	—·114	—·003
IX.	12·81	— ·066	— ·002	+·045	—·072	+·042	—·005	+·017	...	...	+·112	—·051
X.	12·95	+ ·048	— ·019	—·517	+·137	+·062	+·185	...	...	...	+·288	—·195
XI.	40·15	— ·022	— ·047	+·009	—·010	+·002	·000	—·028	—·040	—·058	—·066	—·055
XII.	28·01	— ·006	+ ·076	+·063	+·218	+·038	...	...	+·022	...	+·043	—·091
XIII.	28·88	+ ·012	+ ·035	+·139	—·047	+·003	...	— ·067	+·051	...	—·017	—·095
XIV.	20·16	— ·015	— ·027	+·207	+·038	+·003	...	—·068	—·019	...	—·099	—·058
XV.	10·93	— ·086	— ·069	—·135	—·141	—·006	...	+·260	+·039	...	+·107	—·008

SOLUTION B.

I.	0·71	—0·067	—0·038	...	+·035	...	...	...	+·065	...	...	+·316
II.	11·26	+ ·007	— ·001	—·012	—·044	+·013	+·004	+·037	+·005	...	+·148	+·201
III.	11·73	+ ·050	— ·009	—·018	—·073	+·015	+·002	+·019	+·001	...	+·031	+·117
IV.	27·67	+ ·088	— ·097	—·003	+·003	+·009	...	—·012	—·001	·000	+·132	+·269
V.	8·57	— ·028	— ·036	—·014	...	+·008	...	...	+·002	...	+·150	...
VI.	10·06	+ ·002	+ ·021	+·004	...	...	...	—·025	—·023	...	+·274	...
VII.	17·48	— ·013	— ·026	..	—·032	...	...	...	...	...	+·115	—·132
VIII.	13·75	+ ·037	+ ·002	...	...	...	...	...	...	...	...	...
IX.	12·81	— ·066	— ·002	+·045	—·072	+·042	—·005	+·017	...	...	+·112	—·051
X.	4·24	— ·078	+ ·007	...	...	...	...	...	...	...	...	...
XI.	35·16	— ·013	— ·052	—·027	—·010	+·002	·000	+·037	—·006	...	—·070	—·054
XII.	13·51	— ·050	+ ·067	...	...	...	...	...	...	...	...	...
XIII.	18·14	+ ·013	— ·008	+·043	—·039	—·005	...	—·035	...	..	—·005	—·045
XIV.	14·80	+ ·005	+ ·007	—·055	+·073	+·007	...	—·009	+·023	...	—·079	—·084
XV.	3·71	— ·127	— ·041	...	...	...	...	...	...	...	...	...

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OF $\Delta\mu'$ AND OF THE PERSONAL CORRECTIONS.

symbolical corrections in terms of which z is found.

e	h	p	s	h_g	a'	g'	e'	h'	p'	s'	h_g'
...	...	...	−·302	...	...	...	...	...	...	...	...
−·060	−·029	−·239	−·024	...	+·005	+·002	...	...	−·010	...	...
−·011	+·007	−·090	−·047	...	+·054	+·061	−·078	−·025	−·032	−·018	...
−·124	...	−·213	−·028	−·030	...	...	...	...	...	...	...
−·101	−·026	−·034	−·071	...	...	+·003	+·022	+·007	+·001	...	...
+·005	...	+·010	−·002	...	...	+·063	−·021	+·010	−·086	−·037	+·052
−·017	−·020	...	...	+·012	+·071	−·042	−·012	−·011	...	...	−·008
−·008	+·007	...	...	+·048	+·079	+·030	+·007	−·010	−·027	...	+·023
−·011	−·004	−·047	...	...	+·005	−·038	...	+·012	+·019	...	...
−·013	−·053	...	...	...	−·085	−·055	+·075	...	...	...	...
+·001	−·001	+·034	−·002	+·007	−·086	+·002	+·012	+·007	+·023	·000	+·072
−·001	...	...	+·001	...	−·084	+·012	−·005	...	...	+·004	+·072
+·010	...	+·086	+·020	...	+·002	−·015	...	...	−·006	·000	...
+·050	...	+·067	+·029	...	...	...	...	...	...	...	...
...	...	+·027	+·008	...	−·056	−·034	+·029	...	+·013	+·006	...

...	...	...	−·302	...	...	...	...	...	...	...	...
−·060	−·029	−·239	−·024	...	+·005	+·002	...	...	−·010	...	...
−·019	−·002	−·049	−·001	...	+·075	+·080	−·124	−·039	−·050	−·027	...
−·124	...	−·213	−·028	−·030	...	...	...	...	...	...	...
−·103	...	...	−·072	...	...	+·033	+·022	+·007	+·001	...	...
...	...	−·049	−·023	..	...	+·080	−·070	+·028	−·121	−·059	−·001
...	...	...	...	...	+·100	−·046	−·011	−·013	...	...	−·011
...	...	...	...	...	+·053	+·025	−·017	−·026	−·060	...	+·023
−·011	−·004	−·047	...	...	+·005	−·038	...	+·012	+·019	...	...
...	...	...	...	...	−·172	−·151	+·239	...	...	...	...
·000	−·001	+·027	−·010	...	−·093	+·005	+·014	+·009	+·028	−·001	+·086
...	...	...	...	...	−·219	+·010	−·025	...	...	+·005	+·134
+·020	...	+·043	...	...	+·004	−·004	·000	...	−·009	·000	...
+·057	...	+·078	+·026	...	...	...	...	...	...	...	...
...	...	...	...	...	−·102	−·080	+·096	...	+·043	+·024	...

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The co-efficients of z which result from the symmetrical elimination of $\Delta' x''$ and $\Delta' y''$ are by no means the true values of the weights of the results for z derived from the separate groups.

It is already shown (p. 500) that the apparent weights of $\Delta x''$ and $\Delta y''$ are greater than their true weights.

In the case of z the reverse is the case. In Groups VIII., IX. and XV., where for each group one and the same comparison star is used throughout, the parallax is deduced with entire freedom from the effects of error in the tabular place of the star, and so the computed value of the weight of z from these groups is too small; whilst, in the case of such groups as IV., different comparison stars have in a good many instances been employed in opposite Hemispheres, and consequently the errors of the star-places sensibly affect the true weight of z, though in every case the computed weight of the parallax determination is too small.

These anomalies might have been overcome by employing two systems of weights which we shall call p and p′.

The system p should represent the existing weights, that is to say, the weights corresponding to the mean errors of each class of equations, and therefore *including* the estimated error due to the mean error of the tabular place of the star of comparison.

The system p′ should represent the weight of each equation *excluding* the error of the star's place, but the errors of the co-ordinates of the star's places should appear in symbolic form on the right-hand side of the equation with their appropriate factors.

The Normals should then be formed for each group having regard to the weights p′, and z should be computed, with its weight, from these Normals in terms of the errors of the star-places.

The true weight of z from each group can then be arrived at by having regard to the augmentation of the *mean error* of z which is caused by such portions of the mean errors of the places of the comparison stars as enter into each value of z.

Thus if P_z be the true weight of z derived from any group.

p'_z be the weight of z apart from the errors of the star-places.

α_x and α_y, β_x and β_y, &c., are the mean errors of the x and y co-ordinates of the star-places α and β.

a_x and a_y, b_x and b_y, &c., are the factors of α_x and α_y, β_x and β_y, &c.,

so that the resulting value of z is affected by the errors

$$\pm\ a_x\,\alpha_x \pm a_y\,\alpha_y \pm b_x\,\beta_x \pm b_y\,\beta_y.$$

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then, if we write—

$$[\epsilon_s\,\epsilon_s] = a_x^2\,\alpha_x^2 + a_y^2\,\alpha_y^2 + b_x^2\,\beta_x^2 + b_y^2\,\beta_y^2,$$

and since our weight *unity* corresponds with an estimated *mean error* $= \sqrt{0{\cdot}04}$, we have—

$$P_z = \frac{p'_z}{1 + p'_z \frac{[\epsilon_s\,\epsilon_s]}{0{\cdot}04}}$$

After substitution of the definitive values of $\Delta x''$, $\Delta y''$ and z, the system of weights p should *then* be employed in determining the values of pvv.

As already mentioned at p. 434, I was deterred from the adoption of this method by the probably cumbrous form that the equations would assume, but I could not rest satisfied to leave the discussion in an incomplete state.

The first step is to find for each group the co-efficient of z (that is the apparent weight of z) which would result if the Normals had been formed and solved, having regard to the weights p′ instead of p. To do this rigorously it would be necessary to repeat the whole work *de novo*, employing the system of weights p′ instead of p, but for practical purposes it is sufficient to find the mean value $\frac{p'}{p}$ for each group, and to multiply the co-efficient of z by that factor.

Now we have for any individual equation :—

$$\frac{p'}{p} = \frac{1}{1 - p\,\frac{\epsilon_s\,\epsilon_s}{0{\cdot}04}}$$

where ϵ_s is the mean error of the place of the star of comparison.

But $\epsilon_s\epsilon_s$ has been assumed $= 0{\cdot}002$; therefore, for a set of observations in which a single comparison star has been employed, we have—

$$\frac{p'}{p} = \frac{1}{1 - 0{\cdot}05\,p}$$

or, for double distances or double position-angles,

$$\frac{p'}{p} = \frac{1}{1 - 0{\cdot}10\,p}$$

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The value of $\frac{p'}{p}$ has been computed for each equation, and the mean for each group is given in the following Table :—

MEAN VALUES OF $\frac{p'}{p}$

Group.	A All observations.	B All except Single Distances.	Group.	A All observations.	B All except Single Distances.
I.	1·24	1·24	IX.	1·53	1·53
II.	1·36	1·36	X.	1·21	1·17
III.	1·22	1·28	XI.	1·46	1·51
IV.	1·47	1·47	XII.	1·23	1·21
V.	1·15	1·18	XIII.	1·34	1·44
VI.	1·25	1·24	XIV.	1·41	1·44
VII.	1·29	1·38	XV.	1·17	1·13
VIII.	1·17	1·14			

The next step is to find the value of z in terms of the errors of the star-places.

For brevity, let α_x and α_y denote the *mean errors* of the co-ordinates of the star α.
β_x and β_y " " " " " " " " β.

The co-efficients of these errors will, when transferred to the right-hand side of the equation, be identical with those of the co-efficients of $\Delta x''$ and $\Delta y''$ on the left-hand side. Therefore, to form Normals in $\Delta x''$ which shall contain the true co-efficients of α_x and α_y, we have only to revert to the last step in forming the normal equations, viz., the formation by addition of the quantities [p aa] and [p ab], and to confine the addition to those equations of the group in which the star α was alone employed. The values $[p\ aa]_\alpha$ and $[p\ ab]_\alpha$ so found will be the co-efficients of α_x and α_y respectively, which should appear on the right-hand side of the normal in $\Delta x''$. Similarly forming the values of $[p\ aa]_\beta$ and $[p\ ab]_\beta$ for those equations in which the star β is alone employed, we obtain the co-efficients with which β_x and β_y should appear on the right-hand side of the same normal. When two comparison stars are employed it is convenient, at this stage, to regard $(\alpha\ \beta)_x$ and $(\alpha\ \beta)_y$ as entirely distinct from α_x or β_x or from α_y or β_y, and confining the formation of $[p\ aa]_{\alpha\beta}$ and $[p\ ab]_{\alpha\beta}$ to the equations depending on double distances or double position-angles in which the stars α and β are employed, we obtain the co-efficients with which $(\alpha\ \beta)_x$ and $(\alpha\ \beta)_y$ should appear on the right-hand side of the normal in $\Delta x''$.

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For the Normals in $\Delta y''$ we form $[\mathrm{p}\ ab]_\alpha$ and $[\mathrm{p}\ bb]_\beta$, &c., from the equations involving each star separately, or each pair of stars separately.

For the Normals in z we similarly form $[\mathrm{p}\ ac]_\alpha$ and $[\mathrm{p}\ bc]_\alpha$, &c., for each single star or pair of stars.

Thus, if we put for brevity—

$$\mathrm{d}_x = [\mathrm{p}\ aa]_\alpha;\ \mathrm{e}_x = [\mathrm{p}\ ab]_\alpha;\ \mathrm{f}_x = [\mathrm{p}\ aa]_\beta;\ \mathrm{g}_x = [\mathrm{p}\ ab]_\beta;\ \mathrm{h}_x = [\mathrm{p}\ aa]_{\alpha\beta};\ \mathrm{k}_x = [\mathrm{p}\ ab]_{\alpha\beta}$$
$$\mathrm{d}_y = [\mathrm{p}\ ab]_\alpha;\ \mathrm{e}_y = [\mathrm{p}\ bb]_\alpha;\ \mathrm{f}_y = [\mathrm{p}\ ab]_\beta;\ \mathrm{g}_y = [\mathrm{p}\ bb]_\beta;\ \mathrm{h}_y = [\mathrm{p}\ ab]_{\alpha\beta};\ \mathrm{k}_y = [\mathrm{p}\ bb]_{\alpha\beta}$$
$$\mathrm{d}_z = [\mathrm{p}\ ac]_\alpha;\ \mathrm{e}_z = [\mathrm{p}\ bc]_\alpha;\ \mathrm{f}_z = [\mathrm{p}\ ac]_\beta;\ \mathrm{g}_z = [\mathrm{p}\ bc]_\beta;\ \mathrm{h}_z = [\mathrm{p}\ ac]_{\alpha\beta};\ \mathrm{k}_z = [\mathrm{p}\ bc]_{\alpha\beta}$$

Then, from a group of observations in which the single distances and position-angles have been observed from the stars α or β, and double position-angles and distances from $(\alpha\ \beta)$, the normal equations are—

$$[\mathrm{p}\ aa]\ \Delta x' + [\mathrm{p}\ ab]\ \Delta y' + [\mathrm{p}\ ac]\ z = n_x + d_x\ \alpha_x + e_x\ \alpha_y + f_x\ \beta_x + g_x\ \beta_y + h_x\ (\alpha\ \beta)_x + k_x\ (\alpha\ \beta)_y$$
$$[\mathrm{p}\ ab]\ \Delta x' + [\mathrm{p}\ bb]\ \Delta y' + [\mathrm{p}\ bc]\ z = n_y + d_y\ \alpha_x + e_y\ \alpha_y + f_y\ \beta_x + g_y\ \beta_y + h_y\ (\alpha\ \beta)_x + k_y\ (\alpha\ \beta)_y$$
$$[\mathrm{p}\ ac]\ \Delta x' + [\mathrm{p}\ bc]\ \Delta y' + [\mathrm{p}\ cc]\ z = n_z + d_z\ \alpha_x + e_z\ \alpha_y + f_z\ \beta_x + g_z\ \beta_y + h_z\ (\alpha\ \beta)_x + k_z\ (\alpha\ \beta)_y$$

Eliminating $\Delta x''$ and $\Delta y''$, having regard to the symmetry of the equations (a very simple matter, as all the co-efficients of the solution have been already found), we obtain z with a nominal weight p, and we have—

$$\begin{aligned} z &= m + d\ \alpha_x + e\ \alpha_y + f\ \beta_x + g\ \beta_y + h\ (\alpha\ \beta)_x + k\ (\alpha\ \beta)_y \\ &= m + (d + \tfrac{1}{2}\ h)\ \alpha_x + (e + \tfrac{1}{2}\ k)\ \alpha_y + (f + \tfrac{1}{2}\ h)\ \beta_x + (g + \tfrac{1}{2}\ k)\ \beta_y \end{aligned}$$

In this way the values of z were obtained in terms of the errors of the star-places for both solutions. The results are given in the following Tables.

Effect of the Errors of the Star-places on the Values of z derived from each of the 15 Groups.

SOLUTION A.—All Observations combined.

GROUP.									
I.	0·000								
II.	0·000								
III.	−0·075 θ_x	−0·037 θ_y	+0·075 λ_x	+0·035 λ_y					
IV.	+0·080 ϵ_x	−0·085 ϵ_y	+0·073 λ_x	−0·090 λ_y	+0·001 ι_x	+0·003 ι_y	+0·000 ζ_x	−0·014 ζ_y	+0·007 η_x
		−0·007 η_y	−0·007 γ_x	+0·008 γ_y	+0·002 δ_x	+0·012 δ_y	−0·082 y_x	+0·079 y_y	−0·082 θ_x
		+0·079 θ_y	+0·009 α_x	+0·012 α_y					
V.	+0·004 β_x	−0·018 β_y	+0·004 ζ_x	−0·018 ζ_y	+0·025 α_x	+0·075 α_y	+0·025 γ_x	+0·076 γ_y	+0·043 x_x
		+0·001 x_y	+0·063 y_x	+0·102 y_y	−0·177 z_x	−0·180 z_y			
VI.	−0·047 w_x	−0·003 w_y	+0·051 x_x	+0·120 x_y	−0·010 y_x	−0·115 y_y			
VII.	+0·030 q_x	+0·091 q_y	−0·027 t_x	−0·018 t_y	−0·002 v_x	−0·074 v_y			
VIII.	0·000								
IX.	+0·112 r_x	+0·071 r_y	+0·112 n_x	+0·072 n_y	−0·112 p_x	−0·071 p_y	−0·113 q_x	−0·072 q_y	
X.	0·000								
XI.	−0·064 m_x	−0·002 m_y	+0·013 p_x	+0·062 p_y	+0·003 o_x	−0·002 o_y	+0·028 k_x	+0·016 k_y	+0·013 i_x
		−0·012 i_y	+0·008 l_x	−0·022 l_y	+0·009 n_x	−0·023 n_y	−0·010 h_x	−0·016 h_y	
XII.	+0·003 f_x	+0·160 f_y	−0·003 g_x	−0·160 g_y					
XIII.	−0·030 e_x	−0·036 e_y	+0·030 f_x	+0·036 f_y					
XIV.	+0·002 a_x	+0·001 a_y	+0·002 f_x	+0·001 f_y	+0·027 c_x	−0·079 c_y	−0·061 d_x	+0·030 d_y	+0·014 b_x
		+0·023 b_y	+0·015 e_x	+0·024 e_y					
XV.	0·000								

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SOLUTION B.—All Observations except Single Distances.

GROUP.									
I.	0·000								
II.	0·000								
III.	$-0{\cdot}013\,\theta_x$	$+0{\cdot}060\,\theta_y$	$+0{\cdot}013\,\lambda_x$	$-0{\cdot}061\,\lambda_y$					
IV.	$+0{\cdot}080\,\epsilon_x$	$-0{\cdot}085\,\epsilon_y$	$+0{\cdot}073\,\lambda_x$	$-0{\cdot}090\,\lambda_y$	$+0{\cdot}001\,\iota_x$	$+0{\cdot}003\,\iota_y$	$+0{\cdot}000\,\zeta_x$	$-0{\cdot}014\,\zeta_y$	$+0{\cdot}007\,\kappa_x$
		$-0{\cdot}007\,\eta_y$	$-0{\cdot}007\,\gamma_x$	$+0{\cdot}008\,\gamma_y$	$+0{\cdot}002\,\delta_x$	$+0{\cdot}012\,\delta_y$	$-0{\cdot}082\,y_x$	$+0{\cdot}079\,y_y$	$-0{\cdot}082\,\theta$
		$+0{\cdot}079\,\theta_y$	$+0{\cdot}009\,\alpha_x$	$+0{\cdot}012\,\alpha_y$					
V.	$+0{\cdot}003\,\beta_x$	$-0{\cdot}014\,\beta_y$	$+0{\cdot}027\,\alpha_x$	$+0{\cdot}080\,\alpha_y$	$+0{\cdot}002\,\delta_x$	$-0{\cdot}014\,\delta_y$	$+0{\cdot}026\,\gamma_x$	$+0{\cdot}079\,\gamma_y$	$+0{\cdot}036\,x$
		$+0{\cdot}001\,x_y$	$+0{\cdot}064\,y_x$	$+0{\cdot}106\,y_y$	$-0{\cdot}157\,z_x$	$-0{\cdot}238\,z_y$			
VI.	$+0{\cdot}032\,w_x$	$+0{\cdot}086\,w_y$	$-0{\cdot}086\,x_x$	$+0{\cdot}045\,x_y$	$+0{\cdot}055\,y_x$	$-0{\cdot}135\,y_y$			
VII.	$+0{\cdot}010\,q_x$	$+0{\cdot}110\,q_y$	$+0{\cdot}051\,t_x$	$-0{\cdot}051\,t_y$	$-0{\cdot}062\,v_x$	$-0{\cdot}059\,v_y$			
VIII.	0·000								
IX.	$+0{\cdot}112\,r_x$	$+0{\cdot}071\,r_y$	$+0{\cdot}112\,n_x$	$+0{\cdot}072\,n_y$	$-0{\cdot}112\,p_x$	$-0{\cdot}071\,p_y$	$-0{\cdot}113\,q_x$	$-0{\cdot}072\,q_y$	
X.	0·000								
XI.	$+0{\cdot}017\,p_x$	$+0{\cdot}053\,p_y$	$-0{\cdot}003\,o_x$	$-0{\cdot}007\,o_y$	$-0{\cdot}060\,m_x$	$+0{\cdot}034\,m_y$	$+0{\cdot}024\,k_x$	$-0{\cdot}003\,k_y$	$+0{\cdot}013\,i_x$
		$-0{\cdot}020\,i_y$	$+0{\cdot}011\,n_x$	$-0{\cdot}028\,n_y$	$+0{\cdot}010\,l_x$	$-0{\cdot}028\,l_y$	$-0{\cdot}012\,h_x$	$-0{\cdot}020\,h_y$	
XII.	$+0{\cdot}007\,f_x$	$+0{\cdot}138\,f_y$	$-0{\cdot}008\,g_x$	$-0{\cdot}138\,g_y$					
XIII.	$+0{\cdot}024\,e_x$	$-0{\cdot}010\,e_y$	$-0{\cdot}024\,f_x$	$+0{\cdot}010\,f_y$					
XIV.	$-0{\cdot}031\,a_x$	$-0{\cdot}020\,a_y$	$+0{\cdot}028\,b_x$	$+0{\cdot}044\,b_y$	$+0{\cdot}004\,c_x$	$-0{\cdot}025\,c_y$	$-0{\cdot}031\,f_x$	$-0{\cdot}019\,f_y$	$+0{\cdot}028\,e_x$
		$+0{\cdot}044\,e_y$	$+0{\cdot}003\,d_x$	$-0{\cdot}024\,d_y$					
XV.	0·000								

The mean errors of the star-places, derived from the discussion of the triangulation are—

a_x	$\pm$ 0·050″	a_y	$\pm$ 0·050″	u_x	$\pm$ 0·038″	u_y	$\pm$ 0·050″
b_x	·062	b_y	·046	v_x	·036	v_y	·050
c_x	·049	c_y	·044	w_x	·037	w_y	·044
d_x	·044	d_y	·038	x_x	·038	x_y	·043
e_x	·040	e_y	·041	y_x	·044	y_y	·044
f_x	·036	f_y	·040	z_x	·044	z_y	·043
g_x	·043	g_y	·044	α_x	·050	α_y	·050
h_x	·046	h_y	·047	β_x	·058	β_y	·058
i_x	·049	i_y	·049	γ_x	·053	γ_y	·053
k_x	·038	k_y	·041	δ_x	·044	δ_y	·044
l_x	·087	l_y	·052	ϵ_x	·041	ϵ_y	·041
m_x	·030	m_y	·037	ζ_x	·050	ζ_y	·050
n_x	·044	n_y	·041	η_x	·050	η_y	·050
o_x	·047	o_y	·050	θ_x	·046	θ_y	·046
p_x	·030	p_y	·037	ι_x	·067	ι_y	·067
q_x	·031	q_y	·041	κ_x	·049	κ_y	·049
r_x	·052	r_y	·041	λ_x	·047	λ_y	·047
s_x	·043	s_y	·041	μ_x	·046	μ_y	·046
t_x	·031	t_y	·037				

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Substituting these mean errors for a_x, a_y, b_x, b_y, &c., in the immediately preceding expressions, and taking the sum of the squares of the products for each group, we obtain the values of $[\epsilon_s\epsilon_s]$ which are given below. Then multiplying p_z by the corresponding values of $\frac{p'}{p}$ given at page 512, we obtain for each group the values of p'_z given below for each group. Finally by the formula—

$$P_z = \frac{p_z'}{1 + p_z' \frac{[\epsilon_s\epsilon_s]}{0{\cdot}04}}$$

we obtain the true weights of z given in the column P_z.

Group.	Solution A.				Solution B.			
	p_z	p'_z	$[\epsilon_s\epsilon_s]$	P_z	p_z	p'_z	$[\epsilon_s\epsilon_s]$	P
I.	0·71	0·88	0·0000000	0·9	0·71	0·88	0·0000000	0·9
II.	11·25	15·30	000	15·3	11·25	15·30	000	15·3
III.	17·65	21·53	299	21·2	11·77	15·07	166	15·0
IV.	27·71	40·73	1070	36·8	27·71	40·73	1070	36·8
V.	9·06	10·42	1865	9·9	8·58	10·13	2223	9·6
VI.	17·60	22·00	592	21·3	10·08	12·49	713	12·2
VII.	24·36	31·42	296	30·7	17·47	24·11	402	23·5
VIII.	25·70	30·07	000	30·1	13·65	15·56	000	15·6
IX.	12·83	19·63	1145	18·6	12·83	19·63	1146	18·6
X.	12·98	15·70	000	15·7	4·23	4·95	000	5·0
XI.	40·10	58·55	151	57·3	35·08	52·98	169	51·8
XII.	28·01	34·45	906	32·0	13·50	16·33	675	15·9
XIII.	28·95	38·79	69	38·5	18·20	26·21	20	26·2
XIV.	20·21	28·50	256	28·0	14·93	21·50	189	21·3
XV.	10·97	12·83	000	12·8	3·74	4·23	000	4·2

The effects of the errors of the star-places on the values of $\Delta'x''$ and $\Delta'y''$ which are given in the following Tables have been derived in a similar manner, excepting that the values of $\Delta'x''$ and $\Delta'y''$ are derived from the Normals in $\Delta'x''$ and $'y''$ only, and in terms of z as well as of the errors of the star-places.

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SOLUTION A.

Effect of z and of the Errors of the Star-places on the Values of $\Delta x''$ derived from each of the 15 Groups.

GROUP.									
II.	$-0{\cdot}455\,z$	$+0{\cdot}500\,\mu_x$	$+0{\cdot}000\,\mu_y$	$+0{\cdot}500\,\theta_x$	$+0{\cdot}000\,\theta_y$				
III.	$-0{\cdot}453\,z$	$+0{\cdot}559\,\theta_x$	$-0{\cdot}047\,\theta_y$	$+0{\cdot}442\,\lambda_x$	$+0{\cdot}047\,\lambda_y$				
IV.	$-0{\cdot}332\,z$	$+0{\cdot}126\,\epsilon_x$	$-0{\cdot}052\,\epsilon_y$	$+0{\cdot}189\,\lambda_x$	$-0{\cdot}254\,\lambda_y$	$+0{\cdot}040\,\iota_x$	$+0{\cdot}153\,\iota_y$	$+0{\cdot}045\,\zeta_x$	$+0{\cdot}265\,\zeta_y$
		$+0{\cdot}065\,\eta_x$	$+0{\cdot}194\,\eta_y$	$+0{\cdot}076\,\gamma_x$	$-0{\cdot}108\,\gamma_y$	$+0{\cdot}013\,\delta_x$	$+0{\cdot}095\,\delta_y$	$+0{\cdot}191\,y_x$	$-0{\cdot}188\,y_y$
		$+0{\cdot}191\,\theta_x$	$-0{\cdot}188\,\theta_y$	$+0{\cdot}062\,\alpha_x$	$+0{\cdot}083\,\alpha_y$				
V.	$-0{\cdot}392\,z$	$+0{\cdot}024\,\beta_x$	$-0{\cdot}065\,\beta_y$	$+0{\cdot}024\,\delta_x$	$-0{\cdot}066\,\delta_y$	$+0{\cdot}013\,\alpha_x$	$+0{\cdot}040\,\alpha_y$	$+0{\cdot}013\,\gamma_x$	$+0{\cdot}041$
		$+0{\cdot}196\,x_x$	$+0{\cdot}003\,x_y$	$+0{\cdot}056\,y_x$	$+0{\cdot}093\,y_y$	$+0{\cdot}442\,z_x$	$+0{\cdot}047\,z_y$		
VI.	$-0{\cdot}126\,z$	$+0{\cdot}249\,w_x$	$-0{\cdot}140\,w_y$	$+0{\cdot}649\,x_x$	$+0{\cdot}161\,x_y$	$+0{\cdot}101\,y_x$	$-0{\cdot}022\,y_y$		
VII.	$+0{\cdot}022\,z$	$+0{\cdot}144\,q_x$	$+0{\cdot}004\,q_y$	$+0{\cdot}796\,t_x$	$-0{\cdot}017\,t_y$	$+0{\cdot}059\,v_x$	$+0{\cdot}012\,v_y$		
VIII.	$-0{\cdot}189\,z$	$+1{\cdot}000\,q_x$	$+0{\cdot}000\,q_y$						
IX.	$+0{\cdot}137\,z$	$+0{\cdot}171\,r_x$	$+0{\cdot}064\,r_y$	$+0{\cdot}171\,n_x$	$+0{\cdot}064\,n_y$	$+0{\cdot}330\,p_x$	$-0{\cdot}063\,p_y$	$+0{\cdot}330\,q_x$	$-0{\cdot}064\,q_y$
X.	$-0{\cdot}023\,z$	$+1{\cdot}000\,p_x$	$+0{\cdot}000\,p_y$						
XI.	$-0{\cdot}114\,z$	$+0{\cdot}495\,m_x$	$+0{\cdot}007\,m_y$	$+0{\cdot}094\,p_x$	$-0{\cdot}054\,p_y$	$+0{\cdot}046\,o_x$	$+0{\cdot}039\,o_y$	$+0{\cdot}269\,k_x$	$+0{\cdot}034\,k_y$
		$+0{\cdot}074\,i_x$	$-0{\cdot}007\,i_y$	$+0{\cdot}003\,l_x$	$-0{\cdot}009\,l_y$	$+0{\cdot}004\,n_x$	$-0{\cdot}010\,n_y$	$+0{\cdot}016\,h_x$	$+0{\cdot}001\,h_y$
XII.	$-0{\cdot}003\,z$	$+0{\cdot}816\,f_x$	$-0{\cdot}013\,f_y$	$+0{\cdot}185\,g_x$	$+0{\cdot}014\,g_y$				
XIII.	$-0{\cdot}026\,z$	$+0{\cdot}724\,e_x$	$+0{\cdot}063\,e_y$	$+0{\cdot}276\,f_x$	$-0{\cdot}063\,f_y$				
XIV.	$+0{\cdot}028\,z$	$+0{\cdot}290\,a_x$	$+0{\cdot}176\,a_y$	$+0{\cdot}290\,f_x$	$+0{\cdot}175\,f_y$	$+0{\cdot}049\,c_x$	$-0{\cdot}117\,c_y$	$+0{\cdot}267\,d_x$	$-0{\cdot}399\,d_y$
		$+0{\cdot}052\,b_x$	$+0{\cdot}082\,b_y$	$+0{\cdot}053\,e_x$	$+0{\cdot}083\,e_y$				
XV.	$+0{\cdot}299\,z$	$+1{\cdot}000\,d_x$	$+0{\cdot}000\,d_y$						

Effect of the Errors of the Star-places on the Values of $\Delta y''$ derived from each of the 15 Groups.

GROUP.									
II.	$-0{\cdot}325\,z$	$+0{\cdot}000\,\mu_x$	$+0{\cdot}500\,\mu_y$	$+0{\cdot}000\,\theta_x$	$+0{\cdot}500\,\theta_y$				
III.	$+0{\cdot}038\,z$	$-0{\cdot}034\,\theta_x$	$+0{\cdot}600\,\theta_y$	$+0{\cdot}035\,\lambda_x$	$+0{\cdot}397\,\lambda_y$				
IV.	$-0{\cdot}407\,z$	$-0{\cdot}023\,\epsilon_x$	$+0{\cdot}137\,\epsilon_y$	$-0{\cdot}066\,\lambda_x$	$+0{\cdot}090\,\lambda_y$	$+0{\cdot}032\,\iota_x$	$+0{\cdot}123\,\iota_y$	$+0{\cdot}037\,\zeta_x$	$+0{\cdot}253\,\zeta_y$
		$+0{\cdot}040\,\eta_x$	$+0{\cdot}178\,\eta_y$	$-0{\cdot}032\,\gamma_x$	$+0{\cdot}046\,\gamma_y$	$+0{\cdot}012\,\delta_x$	$+0{\cdot}092\,\delta_y$	$-0{\cdot}018\,y_x$	$+0{\cdot}018\,y_y$
		$-0{\cdot}019\,\theta_x$	$+0{\cdot}019\,\theta_y$	$+0{\cdot}036\,\alpha_x$	$+0{\cdot}048\,\alpha_y$				
V.	$-0{\cdot}141\,z$	$-0{\cdot}057\,\beta_x$	$+0{\cdot}155\,\beta_y$	$-0{\cdot}057\,\delta_x$	$+0{\cdot}155\,\delta_y$	$+0{\cdot}028\,\alpha_x$	$+0{\cdot}087\,\alpha_y$	$+0{\cdot}029\,\gamma_x$	$+0{\cdot}087\,\gamma_y$
		$+0{\cdot}011\,x_x$	$+0{\cdot}000\,x_y$	$+0{\cdot}070\,y_x$	$+0{\cdot}116\,y_y$	$+0{\cdot}437\,z_x$	$+0{\cdot}102\,z_y$		
VI.	$-0{\cdot}108\,z$	$-0{\cdot}115\,w_x$	$+0{\cdot}266\,w_y$	$+0{\cdot}166\,x_x$	$+0{\cdot}626\,x_y$	$+0{\cdot}018\,y_x$	$+0{\cdot}109\,y_y$		
VII.	$-0{\cdot}192\,z$	$+0{\cdot}002\,q_x$	$+0{\cdot}182\,q_y$	$-0{\cdot}011\,t_x$	$+0{\cdot}767\,t_y$	$+0{\cdot}010\,v_x$	$+0{\cdot}050\,v_y$		
VIII.	$-0{\cdot}171\,z$	$+0{\cdot}000\,q_x$	$+1{\cdot}000\,q_y$						
IX.	$-0{\cdot}407\,z$	$+0{\cdot}030\,r_x$	$+0{\cdot}115\,r_y$	$+0{\cdot}030\,n_x$	$+0{\cdot}115\,n_y$	$-0{\cdot}030\,p_x$	$+0{\cdot}385\,p_y$	$-0{\cdot}030\,q_x$	$+0{\cdot}385\,q_y$
X.	$-0{\cdot}477\,z$	$+0{\cdot}000\,p_x$	$+1{\cdot}000\,p_y$						
XI.	$-0{\cdot}174\,z$	$+0{\cdot}008\,m_x$	$+0{\cdot}512\,m_y$	$-0{\cdot}040\,p_x$	$+0{\cdot}167\,p_y$	$+0{\cdot}035\,o_x$	$+0{\cdot}030\,o_y$	$+0{\cdot}020\,k_x$	$+0{\cdot}191\,k_y$
		$-0{\cdot}010\,i_x$	$+0{\cdot}051\,i_y$	$-0{\cdot}007\,l_x$	$+0{\cdot}018\,l_y$	$-0{\cdot}007\,n_x$	$+0{\cdot}019\,n_y$	$+0{\cdot}000\,h_x$	$+0{\cdot}013\,h_y$
XII.	$-0{\cdot}294\,z$	$-0{\cdot}020\,f_x$	$+0{\cdot}751\,f_y$	$+0{\cdot}021\,g_x$	$+0{\cdot}249\,g_y$				
XIII.	$-0{\cdot}265\,z$	$+0{\cdot}055\,e_x$	$+0{\cdot}714\,e_y$	$-0{\cdot}055\,f_x$	$+0{\cdot}287\,f_y$				
XIV.	$-0{\cdot}097\,z$	$+0{\cdot}113\,a_x$	$+0{\cdot}069\,a_y$	$+0{\cdot}114\,f_x$	$+0{\cdot}069\,f_y$	$-0{\cdot}077\,c_x$	$+0{\cdot}186\,c_y$	$-0{\cdot}288\,d_x$	$+0{\cdot}457\,d_y$
		$+0{\cdot}069\,b_x$	$+0{\cdot}108\,b_y$	$+0{\cdot}069\,e_x$	$+0{\cdot}109\,e_y$				
XV.	$-0{\cdot}336\,z$	$+0{\cdot}000\,d_x$	$+1{\cdot}000\,d_y$						

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SOLUTION B.

Effect of z and of the Errors of the Star-places on the Values of $\Delta x'$ derived from each of the Groups.

GROUP.									
II.	$-0{\cdot}455\,z$	$+0{\cdot}500\,\mu_x$	$+0{\cdot}000\,\mu_y$	$+0{\cdot}500\,\theta_x$	$+0{\cdot}000\,\theta_y$				
III.	$-0{\cdot}469\,z$	$+0{\cdot}551\,\theta_x$	$+0{\cdot}005\,\theta_y$	$+0{\cdot}449\,\lambda_x$	$-0{\cdot}004\,\lambda_y$				
IV.	$-0{\cdot}332\,z$	$+0{\cdot}126\,\epsilon_x$	$-0{\cdot}052\,\epsilon_y$	$+0{\cdot}189\,\lambda_x$	$-0{\cdot}254\,\lambda_y$	$+0{\cdot}040\,\iota_x$	$+0{\cdot}153\,\iota_y$	$+0{\cdot}045\,\zeta_x$	$+0{\cdot}265\,\zeta_y$
		$+0{\cdot}065\,\eta_x$	$+0{\cdot}194\,\eta_y$	$+0{\cdot}076\,\gamma_x$	$-0{\cdot}108\,\gamma_y$	$+0{\cdot}013\,\delta_x$	$+0{\cdot}095\,\delta_y$	$+0{\cdot}191\,y_x$	$-0{\cdot}188\,y_y$
		$+0{\cdot}191\,\theta_x$	$-0{\cdot}188\,\theta_y$	$+0{\cdot}062\,\alpha_x$	$+0{\cdot}083\,\alpha_y$				
V.	$-0{\cdot}417\,z$	$+0{\cdot}067\,\beta_x$	$-0{\cdot}169\,\beta_y$	$+0{\cdot}014\,\alpha_x$	$+0{\cdot}042\,\alpha_y$	$+0{\cdot}066\,\delta_x$	$-0{\cdot}168\,\delta_y$	$+0{\cdot}014\,\gamma_x$	$+0{\cdot}042\,\gamma_y$
		$+0{\cdot}343\,x_x$	$+0{\cdot}006\,x_y$	$+0{\cdot}076\,y_x$	$+0{\cdot}126\,y_y$	$+0{\cdot}426\,z_x$	$+0{\cdot}122\,z_y$		
VI.	$+0{\cdot}427\,z$	$+0{\cdot}342\,w_x$	$-0{\cdot}065\,w_y$	$+0{\cdot}486\,x_x$	$+0{\cdot}005\,x_y$	$+0{\cdot}175\,y_x$	$+0{\cdot}058\,y_y$		
VII.	$-0{\cdot}122\,z$	$+0{\cdot}326\,q_x$	$-0{\cdot}014\,q_y$	$+0{\cdot}590\,t_x$	$-0{\cdot}064\,t_y$	$+0{\cdot}083\,v_x$	$+0{\cdot}078\,v_y$		
VIII.	$+0{\cdot}118\,z$	$+1{\cdot}000\,q_x$	$+0{\cdot}000\,q_y$						
IX.	$+0{\cdot}137\,z$	$+0{\cdot}171\,r_x$	$+0{\cdot}064\,r_y$	$+0{\cdot}171\,n_x$	$+0{\cdot}064\,n_y$	$+0{\cdot}330\,p_x$	$-0{\cdot}063\,p_y$	$+0{\cdot}330\,q_x$	$-0{\cdot}064\,q_y$
X.	$-0{\cdot}127\,z$	$+1{\cdot}000\,p_x$	$+0{\cdot}000\,p_y$						
XI.	$-0{\cdot}120\,z$	$+0{\cdot}094\,p_x$	$-0{\cdot}052\,p_y$	$+0{\cdot}047\,o_x$	$+0{\cdot}039\,o_y$	$+0{\cdot}485\,m_x$	$+0{\cdot}003\,m_y$	$+0{\cdot}270\,k_x$	$+0{\cdot}035\,k_y$
		$+0{\cdot}074\,i_x$	$-0{\cdot}006\,i_y$	$+0{\cdot}004\,n_x$	$-0{\cdot}010\,n_y$	$+0{\cdot}003\,l_x$	$-0{\cdot}009\,l_y$	$+0{\cdot}015\,h_x$	$+0{\cdot}000\,h_y$
XII.	$+0{\cdot}189\,z$	$+0{\cdot}518\,f_x$	$-0{\cdot}482\,f_y$	$+0{\cdot}480\,g_x$	$+0{\cdot}487\,g_y$				
XIII.	$-0{\cdot}211\,z$	$+0{\cdot}577\,e_x$	$-0{\cdot}013\,e_y$	$+0{\cdot}425\,f_x$	$+0{\cdot}013\,f_y$				
XIV.	$-0{\cdot}178\,z$	$+0{\cdot}352\,a_x$	$+0{\cdot}213\,a_y$	$+0{\cdot}037\,b_x$	$+0{\cdot}058\,b_y$	$+0{\cdot}113\,c_x$	$-0{\cdot}271\,c_y$	$+0{\cdot}351\,f_x$	$+0{\cdot}213\,f_y$
		$+0{\cdot}037\,e_x$	$+0{\cdot}057\,e_y$	$+0{\cdot}112\,d_x$	$-0{\cdot}270\,d_y$				
XV.	$+0{\cdot}324\,z$	$+1{\cdot}000\,d_x$	$+0{\cdot}000\,d_y$						

Effect of z and of the Errors of the Star-places on the Values of $\Delta y'$ derived from each of the 15 Groups.

GROUP.									
II.	$-0{\cdot}325\,z$	$+0{\cdot}000\,\mu_x$	$+0{\cdot}500\,\mu_y$	$+0{\cdot}000\,\theta_x$	$+0{\cdot}500\,\theta_y$				
III.	$+0{\cdot}002\,z$	$-0{\cdot}001\,\theta_x$	$+0{\cdot}508\,\theta_y$	$-0{\cdot}002\,\lambda_x$	$+0{\cdot}363\,\lambda_y$				
IV.	$-0{\cdot}407\,z$	$-0{\cdot}023\,\epsilon_x$	$+0{\cdot}137\,\epsilon_y$	$-0{\cdot}066\,\lambda_x$	$+0{\cdot}090\,\lambda_y$	$+0{\cdot}032\,\iota_x$	$+0{\cdot}123\,\iota_y$	$+0{\cdot}037\,\zeta_x$	$+0{\cdot}253\,\zeta_y$
		$+0{\cdot}040\,\eta_x$	$+0{\cdot}178\,\eta_y$	$-0{\cdot}032\,\gamma_x$	$+0{\cdot}046\,\gamma_y$	$+0{\cdot}012\,\delta_x$	$+0{\cdot}092\,\delta_y$	$-0{\cdot}018\,y_x$	$+0{\cdot}018\,y_y$
		$-0{\cdot}019\,\theta_x$	$+0{\cdot}019\,\theta_y$	$+0{\cdot}036\,\alpha_x$	$+0{\cdot}048\,\alpha_y$				
V.	$-0{\cdot}135\,z$	$-0{\cdot}069\,\beta_x$	$+0{\cdot}187\,\beta_y$	$+0{\cdot}028\,\alpha_x$	$+0{\cdot}086\,\alpha_y$	$-0{\cdot}068\,\delta_x$	$+0{\cdot}187\,\delta_y$	$+0{\cdot}028\,\gamma_x$	$+0{\cdot}086\,\gamma_y$
		$-0{\cdot}034\,x_x$	$-0{\cdot}001\,x_y$	$+0{\cdot}064\,y_x$	$+0{\cdot}106\,y_y$	$+0{\cdot}050\,z_x$	$+0{\cdot}347\,z_y$		

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SOLUTION B.

Effect of z and of the Errors of the Star-places on the Values of $\Delta y'$ derived from each of the 15 Groups—*continued.*

Group.									
VI.	$+0{\cdot}321\,z$	$-0{\cdot}044\,w_x$	$+0{\cdot}301\,w_y$	$-0{\cdot}002\,x_x$	$+0{\cdot}499\,x_y$	$+0{\cdot}043\,y_x$	$+0{\cdot}175\,y_y$		
VII.	$-0{\cdot}242\,z$	$-0{\cdot}008\,q_x$	$+0{\cdot}213\,q_y$	$-0{\cdot}023\,t_x$	$+0{\cdot}758\,t_y$	$+0{\cdot}032\,v_x$	$+0{\cdot}030\,v_y$		
VIII.	$-0{\cdot}070\,z$	$+0{\cdot}000\,q_x$	$+1{\cdot}000\,q_y$						
IX.	$-0{\cdot}407\,z$	$+0{\cdot}030\,r_x$	$+0{\cdot}115\,r_y$	$+0{\cdot}030\,n_x$	$+0{\cdot}115\,n_y$	$-0{\cdot}030\,p_x$	$+0{\cdot}385\,p_y$	$-0{\cdot}030\,q_x$	$+0{\cdot}385\,q_y$
X.	$-0{\cdot}422\,z$	$+0{\cdot}000\,p_x$	$+1{\cdot}000\,p_y$						
XI.	$-0{\cdot}253\,z$	$-0{\cdot}044\,p_x$	$+0{\cdot}196\,p_y$	$+0{\cdot}043\,o_x$	$+0{\cdot}036\,o_y$	$-0{\cdot}007\,m_x$	$+0{\cdot}423\,m_y$	$+0{\cdot}033\,k_x$	$+0{\cdot}227\,k_y$
		$-0{\cdot}009\,i_x$	$+0{\cdot}060\,i_y$	$-0{\cdot}008\,n_x$	$+0{\cdot}022\,n_y$	$-0{\cdot}008\,l_x$	$+0{\cdot}021\,l_y$	$+0{\cdot}000\,h_x$	$+0{\cdot}015\,h_y$
XII.	$-0{\cdot}278\,z$	$-0{\cdot}225\,f_x$	$+0{\cdot}747\,f_y$	$+0{\cdot}224\,g_x$	$+0{\cdot}253\,g_y$				
XIII.	$-0{\cdot}382\,z$	$-0{\cdot}018\,e_x$	$+0{\cdot}607\,e_y$	$+0{\cdot}018\,f_x$	$+0{\cdot}392\,f_y$				
XIV.	$+0{\cdot}099\,z$	$+0{\cdot}054\,a_x$	$+0{\cdot}033\,a_y$	$+0{\cdot}084\,b_x$	$+0{\cdot}133\,b_y$	$-0{\cdot}139\,c_x$	$+0{\cdot}334\,c_y$	$+0{\cdot}054\,f_x$	$+0{\cdot}033\,f_y$
		$+0{\cdot}084\,e_x$	$+0{\cdot}132\,e_y$	$-0{\cdot}138\,d_x$	$+0{\cdot}334\,d_y$				
XV.	$-0{\cdot}441\,z$	$+0{\cdot}000\,d_x$	$+1{\cdot}000\,d_y$						

With these data and with the same formulæ as in the case of z we obtain the weights of $\Delta'x'$ and $\Delta'y'$ which were employed in the determination of μ (p. 500).

The equations available for definitive determination of the personal errors are given in the following Tables.

The absolute terms, given under columns v_1, are identical with the corresponding residuals under the columns v_1 in the Tables containing the equations of condition, pp. 476–489 ; that is to say, they represent the equations corrected for the definitive tabular errors of the Ephemeris.

The figures given in columns v_2 represent the residuals after correction for the small personal terms obtained by the subsequent solution of these equations.

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Comparison of observed and computed Distances, to determine the values of the Symbolical Corrections ΔA, ΔG, &c., a, g, &c., a', g', &c.

Auwers. Double Distances.

Set.	Factors of a	Factors of ΔA	v_1	p	v_2
			″		″
II. 1	+0·59	+0·02	+0·260	1·53	+0·293
2	+ ·60	− ·08	− ·185	2·86	− ·151
III. 3	+ ·60	− ·33	− ·238	3·26	− ·204
IV. 1	+ ·65	+ ·02	+ ·024	2·86	+ ·061
4	+ ·69	− ·06	− ·027	2·86	+ ·012
5	− ·41	+ ·04	+ ·157	2·86	+ ·134
8	+ ·63	− ·02	+ ·004	2·69	+ ·039
9	− ·31	− ·08	− ·016	4·31	− ·033
12	+ ·73	·00	− ·190	2·86	− ·149
13	+ ·09	− ·01	− ·020	3·47	− ·015
V. 1	+ ·57	+ ·03	+ ·153	3·47	+ ·185
2	− ·10	− ·02	+ ·103	3·47	+ ·097
6_x	+ ·74	+ ·24	− ·077	2·81	− ·035
6_y	− ·16	− ·17	− ·033	2·81	− ·042
6_z	− ·80	− ·18	+ ·107	2·81	+ ·062
VI. 2	+ ·54	+ ·01	+ ·063	5·63	+ ·093
VII. 7	+ ·78	·00	− ·151	2·82	− ·107
IX. 2	+ ·73	+ ·18	− ·006	5·63	+ ·035
3	+ ·51	+ ·02	− ·084	3·47	− ·055
XI. 1	+ ·66	+ ·25	− ·002	5·63	+ ·035
5	+ ·28	+ ·27	− ·055	3·26	− ·039
XIII. 2	+ ·40	+ ·19	− ·110	3·26	− ·088
3	+ ·39	− ·16	+ ·041	5·63	+ ·063
XIV. 3	+ ·22	− ·03	− ·131	4·30	− ·119
6	+ ·23	+ ·23	− ·019	5·63	− ·006

Single Distances.

III. 6	−0·57	−1·03	−0·133	2·76	−0·165
VI. 1	+ ·37	−1·23	+ ·058	8·47	+ ·079
VII. 3	− ·62	0·00	− ·007	3·76	− ·042
4	− ·80	−1·56	+ ·002	3·76	− ·042
VIII. 1	+ ·73	− ·85	+ ·052	7·49	+ ·093
4	+ ·22	0·00	− ·267	3·76	− ·255
5	− ·54	−1·79	− ·030	3·76	− ·060
X. 2	+ ·57	−1·89	− ·030	6·19	+ ·003
3	− ·20	−2·86	+ ·031	5·10	+ ·021
6	− ·67	−0·96	+ ·040	4·77	+ ·003
XI. 4	+ ·17	−1·45	− ·025	3·76	− ·015
XII. 1	+ ·25	−1·39	− ·052	5·10	− ·037
3	+ ·49	−1·56	− ·137	6·19	− ·109
4	+ ·46	−1·47	− ·076	6·19	− ·049
7	− ·41	0·00	+ ·191	5·33	+ ·168
XIII. 7	− ·26	−1·59	− ·035	3·76	− ·049
XIV. 5	+ ·17	−1·05	− ·074	7·49	− ·064
XV. 2	+ ·11	−1·61	+ ·043	6·19	+ ·050
3	+ ·49	−1·92	+ ·121	3·76	+ ·149
5	− ·08	−1·96	+ ·009	3·76	+ ·005
7	− ·24	−1·22	+ ·089	6·34	+ ·076

Gill. Double Distances.

Set.	Factors of g	Factors of ΔG	v_1	p	v_2
			″		″
I. 1	+0·37	+0·04	+0·255	2·95	+0·254
II. 3	+ ·60	− ·13	+ ·048	5·21	+ ·047
III. 2	+ ·56	+ ·06	− ·081	2·95	− ·083
4	+ ·58	− ·47	+ ·144	1·58	+ ·145
IV. 2	− ·29	− ·03	+ ·196	2·95	+ ·197
3	− ·27	− ·02	− ·030	5·21	− ·029
6	+ ·64	·00	− ·219	5·21	− ·221
7	− ·39	+ ·07	− ·050	5·21	− ·049
10	+ ·73	+ ·07	·000	5·21	− ·003
11	− ·30	+ ·02	+ ·003	2·01	+ ·004
14	+ ·72	− ·05	− ·177	3·71	− ·179
VII. 6	+ ·78	+ ·19	+ ·015	5·21	+ ·012
IX. 1	+ ·49	+ ·08	+ ·029	5·21	+ ·027
4	+ ·71	− ·40	+ ·162	2·01	+ ·162
XI. 2	+ ·66	− ·12	− ·106	2·01	− ·107
3	+ ·55	− ·01	+ ·080	5·21	+ ·078
6	− ·29	+ ·02	− ·102	5·21	− ·101
7	+ ·16	+ ·35	+ ·038	2·95	+ ·036
XIII. 1	+ ·41	+ ·35	+ ·006	5·21	+ ·003
XIV. 2	+ ·25	− ·01	+ ·075	5·21	+ ·074
4	− ·19	+ ·33	− ·022	3·71	− ·023

Single Distances.

III. 1	−0·02	−0·94	−0·013	3·48	−0·008
5	+ ·50	−1·37	− ·101	4·36	− ·095
V. 4	+ ·79	−1·27	+ ·128	4·36	+ ·132
VII. 2	+ ·54	0·00	− ·118	4·36	− ·120
5	− ·77	−1·12	− ·067	4·36	− ·059
VIII. 2	+ ·72	−1·05	− ·079	4·36	− ·076
3	+ ·53	−1·82	+ ·059	7·14	+ ·067
X. 1	+ ·65	−1·49	+ ·052	4·36	+ ·058
4	− ·47	−2·22	+ ·010	3·10	+ ·023
5	− ·67	−1·19	− ·173	4·36	− ·165
XII. 2	+ ·50	−1·27	− ·085	7·14	− ·080
5	+ ·43	0·00	− ·153	4·36	− ·154
6	− ·39	0·00	+ ·226	2·46	+ ·227
XIII. 4	+ ·34	−1·33	+ ·067	5·36	+ ·073
5	+ ·03	0·00	+ ·134	4·36	+ ·134
6	− ·28	−1·79	+ ·059	4·36	+ ·069
XV. 1	+ ·11	−1·56	+ ·085	4·36	+ ·093
4	+ ·04	−1·96	− ·117	5·17	− ·107
6	− ·24	−1·30	− ·035	4·36	− ·028

Elkin. Double Distances.

Set.	Factors of e	Factors of ΔE	v_1	p	v_2
			″		″
II. 7	+0·60	−0·13	−0·101	1·43	−0·119
III. 9	+ ·59	− ·47	− ·222	1·43	− ·230
IV. 19	+ ·68	·00	− ·012	1·73	− ·036
20	+ ·65	− ·06	+ ·036	1·43	+ ·014
21	+ ·64	− ·02	+ ·193	1·43	+ ·171
22	− ·38	+ ·08	+ ·179	1·43	+ ·190
V. 9	+ ·55	− ·04	− ·011	2·03	− ·030
IX. 7	+ ·50	+ ·05	+ ·028	1·43	+ ·009
8	+ ·73	− ·39	+ ·028	1·43	+ ·013
XI. 12	+ ·17	+ ·14	+ ·318	0·71	+ ·308
13	+ ·24	+ ·06	− ·005	0·74	− ·015
XIII. 12	+ ·41	+ ·15	+ ·006	0·74	− ·013
13	+ ·39	− ·35	+ ·131	0·74	+ ·127
XIV. 11	− ·16	− ·02	+ ·013	2·03	+ ·019
12	+ ·26	+ ·02	+ ·189	1·43	+ ·179
13	− ·18	+ ·15	+ ·137	1·43	+ ·139
14	+ ·23	+ ·17	+ ·196	1·43	+ ·183

Single Distances.

III. 7	−0·41	−0·76	−0·416	0·32	−0·380
11	+ ·43	−1·69	− ·351	0·32	− ·319
V. 14	− ·80	−1·08	− ·375	0·46	− ·316
VI. 6	− ·22	−1·41	+ ·125	0·46	+ ·172
VII. 9	− ·68	−1·96	− ·173	0·46	− ·094
14	− ·81	−1·12	+ ·015	0·59	+ ·076
VIII. 7	+ ·73	−1·06	+ ·455	0·25	+ ·458
9	+ ·04	−2·56	+ ·055	0·59	+ ·125
10	− ·65	−1·39	− ·259	0·59	− ·197
X. 8	+ ·46	−2·22	− ·266	0·46	− ·220
XII. 10	+ ·11	−1·45	+ ·208	0·59	+ ·245
13	− ·46	−2·94	+ ·654	0·17	+ ·753
XIII. 14	− ·28	−1·57	− ·126	0·17	− ·072
15	− ·28	−1·47	+ ·322	0·32	+ ·373
XV. 8	+ ·08	−1·72	− ·249	0·17	− ·204

Hall. Double Distances.

	h	ΔH			
II. 6	+0·59	−0·08	−0·430	0·72	−0·478
III. 10	+ ·60	− ·50	+ ·047	0·37	− ·019
IX. 6	+ ·75	+ ·18	− ·197	0·54	− ·246
9	+ ·49	·00	− ·015	0·54	− ·052
XI. 14	+ ·25	+ ·04	+ ·097	0·37	+ ·080

Single Distances.

III. 8	−0·43	−0·75	−0·460	0·39	−0·459
12	+ ·38	−1·82	+ ·446	0·27	+ ·341
V. 10	+ ·79	−1·82	+ ·189	0·27	+ ·053
13	− ·80	−1·16	− ·181	0·75	− ·170
VII. 8	− ·63	−2·27	− ·110	0·97	− ·158
15	− ·81	−1·00	+ ·143	0·64	+ ·162
VIII. 8	+ ·26	−2·44	+ ·170	0·97	+ ·048
X. 7	+ ·55	−1·92	+ ·220	1·17	+ ·098

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COMPARISON OF OBSERVED AND COMPUTED DISTANCES, TO DETERMINE THE VALUES OF THE SYMBOLICAL CORRECTIONS ΔA, ΔG, &c., *a*, *g*, &c., *a'*, *g'*, &c.—*continued.*

PETER. Double Distances.

Set.	Factors of *p*	Factors of ΔP		p	v_2
			″		″
II. 4	+0·62	−0·06	+0·100	1·97	+0·003
5	+ ·61	− ·12	+ ·085	3·33	− ·010
III. 14	+ ·58	+ ·06	+ ·275	1·07	+ ·183
15	+ ·59	− ·36	+ ·138	3·33	+ ·048
IV. 15	+ ·65	+ ·02	+ ·126	3·33	+ ·024
16	+ ·65	+ ·02	+ ·227	1·97	+ ·125
17	+ ·63	− ·02	+ ·072	1·07	− ·027
18	+ ·70	+ ·08	− ·022	3·33	− ·133
VI. 3	+ ·60	− ·27	+ ·015	1·97	− ·077
4	+ ·54	+ ·32	+ ·133	1·07	+ ·046
IX. 5	+ ·71	− ·24	− ·254	1·07	− ·364
XI. 8	+ ·18	·00	+ ·015	1·97	− ·013
9	+ ·53	− ·54	+ ·292	3·33	+ ·212
11	+ ·28	+ ·22	+ ·106	1·97	+ ·061
XIII. 9	+ ·38	− ·30	+ ·089	1·97	+ ·031
XIV. 7	+ ·26	+ ·03	− ·068	1·97	− ·109
8	− ·18	+ ·12	+ ·038	1·97	+ ·065
9	+ ·22	− ·01	− ·020	3·33	− ·054

PETER. Single Distances.

Set.	Factors of *p*	Factors of ΔP	v_1	p	v_2
			″		″
III. 13	−0·36	−0·81	+0·065	1·35	+0·127
16	− ·15	−2·08	− ·372	1·35	− ·335
17	− ·55	−1·16	+ ·104	2·28	+ ·198
V. 8	− ·79	−1·41	− ·321	1·35	− ·188
XI. 10	+ ·24	−1·41	+ ·124	1·86	+ ·096
XIII. 8	+ ·37	−0·74	+ ·225	0·74	+ ·172
10	+ ·	−1·49	− ·048	2·68	− ·092
11	− ·27	−1·61	− ·003	2·68	+ ·050
XIV. 10	+ ·16	−1·04	+ ·137	1·35	+ ·119
XV. 9	− ·17	−1·61	− ·040	1·86	− ·003

SCHUR. Double Distances.

	s	ΔS			
I. 2	+0·36	−0·07	+0·176	0·63	+0·180
II. 8	+ ·60	− ·13	− ·227	0·63	− ·221
III. 19	+ ·60	− ·39	+ ·204	1·24	+ ·212
IV. 23	+ ·65	+ ·02	− ·249	1·24	− ·243
V. 15	+ ·56	− ·02	+ ·014	1·24	+ ·019
VI. 7	+ ·60	− ·30	− ·130	0·63	− ·123
9	+ ·53	+ ·24	+ ·161	1·24	+ ·165
XI. 16	+ ·29	+ ·19	+ ·161	1·24	+ ·163
XIV. 15	− ·16	− ·05	− ·110	1·24	− ·111
17	+ ·26	+ ·29	− ·219	1·24	− ·218

SCHUR. Single Distances.

Set.	Factors of *s*	Factors of ΔS	v_1	p	v_2
			″		″
III. 20	−0·74	−2·12	−0·289	0·93	−0·285
21	− ·55	−1·19	+ ·244	0·93	+ ·245
VI. 8	+ ·26	−1·35	− ·171	0·93	− ·162
XI. 15	+ ·23	−1·45	− ·007	0·93	+ ·003
XII. 14	+ ·17	−1·41	+ ·011	0·93	+ ·020
15	+ ·49	−1·52	+ ·071	0·47	+ ·084
XIII. 17	− ·36	− ·70	+ ·081	0·47	+ ·081
18	− ·26	−1·59	− ·056	0·93	− ·050
XIV. 16	+ ·16	−1·04	− ·141	0·93	− ·134
XV. 10	+ ·12	−1·64	+ ·116	0·47	+ ·126
11	− ·17	−1·61	+ ·556	0·47	+ ·563

HARTWIG. Double Distances.

	hg	ΔH_g			
IV. 24	+0·68	+0·01	+0·321	1·60	+0·152

HARTWIG. Single Distances.

VII. 17	−0·81	−1·21	−0·217	1·48	+0·026
VIII. 11	+ ·72	−1·01	+ ·100	1·48	− ·045
12	+ ·60	−1·52	− ·172	0·76	− ·269
XI. 17	+ ·17	−1·47	+ ·144	1·48	+ ·152

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Comparison of observed and computed Position-Angles, to determine the values of the Symbolical Corrections a', g', e', &c.

Auwers.
Double Position-Angles.

Set.	Factor of a'	v_1	p	v_2
		″		″
II. 9	+0·09	−0·101	3·60	−0·098
11	+ ·07	+ ·018	3·60	+ ·020
III. 23	+ ·24	+ ·023	7·68	+ ·031
VII. 24	+ ·12	+ ·128	7·68	+ ·132
IX. 11	− ·17	− ·037	13·24	− ·043
XI. 18	+ ·18	− ·031	13·24	− ·025
21	− ·58	+ ·022	13·24	+ ·002
XIII. 20	+ ·05	+ ·007	13·24	+ ·009
21	+ ·05	+ ·006	7·68	+ ·008

Single Position-Angles.

Set.	Factor of a'	v_1	p	v_2
VII. 20	−0·53	+0·008	3·70	−0·010
21	− ·10	+ ·029	2·61	+ ·026
VIII. 13	+ ·29	+ ·062	5·20	+ ·072
16	+ ·73	+ ·077	4·30	+ ·102
17*a*	+ ·59	+ ·119	3·54	+ ·139
X. 10	− ·47	+ ·019	2·61	+ ·003
11	− ·93	+ ·187	2·61	+ ·156
13	− ·23	− ·188	3·31	− ·196
XI. 20	+ ·62	− ·004	2·61	+ ·017
XII. 16	− ·83	+ ·149	4·30	+ ·121
18	+ ·11	− ·052	4·30	− ·048
19	+ ·12	− ·159	2·19	− ·155
22	+ ·15	− ·080	3·70	− ·075
23	+ ·07	+ ·037	4·30	+ ·039
XIII. 25	+ ·11	− ·021	4·30	− ·017
XV. 13	+ ·24	− ·119	2·61	− ·111
14	+ ·26	− ·051	2·61	− ·042
16	+ ·27	+ ·018	2·61	+ ·027
18	+ ·18	− ·102	5·20	− ·096

Gill.
Double Position-Angles.

Set.	g'	v_1	p	v_2
II. 10	+0·07	−0·005	2·34	−0·007
III. 22	+ ·27	− ·053	4·99	− ·062
24	+ ·25	+ ·100	4·99	+ ·091
VII. 23	+ ·10	+ ·021	4·99	+ ·018
IX. 10	+ ·59	+ ·132	2·91	+ ·111
12	− ·19	− ·062	4·99	− ·055

Gill.
Double Position-Angles—*cont.*

Set.	Factor of g'	v_1	p	v_2
		″		″
XI. 19	+0·18	+0·275	3·48	+0·269
22	− ·56	+ ·022	4·99	+ ·041
23	+ ·59	− ·056	4·99	− ·077
XIII. 19	+ ·05	− ·069	2·50	− ·071
22	+ ·06	+ ·101	2·16	+ ·099

Single Position-Angles.

Set.	Factor of g'	v_1	p	v_2
III. 25	+0·42	−0·310	1·40	−0·325
V. 16	+ ·02	− ·061	3·14	− ·062
VI. 10	+ ·78	− ·098	1·40	− ·125
VII. 19	− ·50	+ ·083	3·51	+ ·100
22	− ·08	+ ·006	1·82	+ ·009
VIII. 14	+ ·34	− ·171	3·14	− ·183
15	+ ·59	+ ·175	3·14	+ ·154
17*b*	+ ·44	+ ·024	1·40	+ ·009
X. 9	− ·35	− ·045	4·09	− ·033
12	− ·27	+ ·029	3·14	+ ·038
XII. 17	+ ·09	− ·175	3·14	− ·178
20	+ ·25	+ ·131	3·52	+ ·122
21	+ ·25	− ·023	3·52	− ·032
XIII. 23	+ ·62	+ ·117	2·48	+ ·095
24	+ ·12	+ ·315	1·24	+ ·311
XV. 12	+ ·24	+ ·029	4·09	+ ·021
15	+ ·26	+ ·050	2·48	+ ·041
17	+ ·19	+ ·133	0·79	+ ·126

Elkin.
Double Position-Angles.

Set.	e'	v_1	p	v_2
III. 29	+0·24	+0·031	2·03	+0·014
XI. 24	+ ·58	+ ·590	0·53	+ ·550
25	− ·53	− ·132	1·06	− ·095
XIII. 26	+ ·05	− ·099	2·03	− ·102
27	+ ·06	− ·023	2·03	− ·027

Single Position-Angles.

Set.	Factor of e'	v_1	p	v_2
III. 27	−0·48	−0·109	1·13	−0·076
31	+ ·51	+ ·237	2·09	+ ·202
V. 19	+ ·14	− ·226	1·13	− ·236
22	+ ·05	+ ·181	1·63	+ ·178

Elkin.
Single Position-Angles—*cont.*

Set.	Factor of e'	v_1	p	v_2
		″		″
VI. 13	−0·79	+0·059	1·63	+0·114
VII. 26	+ ·46	− ·157	1·63	− ·189
28	− ·36	− ·051	2·09	− ·026
29	− ·08	+ ·189	2·09	+ ·195
VIII. 18	+ ·33	− ·186	1·63	− ·209
20	+ ·79	− ·157	1·13	− ·212
21	+ ·43	+ ·111	1·13	+ ·081
X. 15	− ·58	+ ·047	1·63	+ ·087
XII. 24	− ·53	− ·283	1·13	− ·246
25	+ ·23	+ ·091	1·63	+ ·075
26	+ ·34	+ ·005	0·87	− ·019
27	+ ·10	− ·171	1·13	− ·178
XIII. 28	+ ·11	+ ·077	1·13	+ ·069
29	+ ·10	− ·276	1·13	− ·283
XV. 19	+ ·24	+ ·248	1·39	+ ·231

Hall.
Double Position-Angles.

Set.	h'	v_1	p	v_2
III. 30	+0·24	+0·240	0·57	+0·275
IX. 13	− ·18	− ·013	0·84	− ·039
XI. 25*a*	− ·52	+ ·272	0·57	+ ·197

Single Position-Angles.

Set.	Factor of h'	v_1	p	v_2
III. 28	−0·47	+0·139	0·47	+0·071
32	+ ·54	− ·202	0·31	− ·124
V. 20	+ ·11	− ·094	0·47	− ·078
21	+ ·04	− ·448	0·24	− ·442
VI. 12	+ ·81	+ ·350	0·40	+ ·467
VII. 25	+ ·52	− ·714	0·31	− ·639
27	− ·55	+ ·044	0·47	− ·035
30	− ·07	− ·224	0·76	− ·234
VIII. 19	+ ·75	− ·126	0·61	− ·018

Schur.
Double Position-Angles.

Set.	s'	v_1	p	v_2
III. 34	+0·27	+0·331	0·91	+0·325
VI. 15	+ ·53	+ ·153	0·91	+ ·141
XIII. 32	+ ·05	+ ·210	0·91	+ ·209

Schur.
Single Position-Angles.

Set.	Factor of s'	v_1	p	v_2
		″		″
III. 33	−0·53	−0·163	0·33	−0·151
35	+ ·82	− ·310	0·33	− ·328
36	+ ·40	− ·501	0·33	− ·510
VI. 16	+ ·73	+ ·226	0·33	+ ·210
XI. 29	+ ·61	+ ·261	0·33	+ ·247
XII. 29	− ·51	+ ·259	0·33	+ ·270
XIII. 33	+ ·12	− ·282	0·33	− ·285
XV. 21	+ ·24	− ·665	0·17	− ·679
22	+ ·23	− ·583	0·33	− ·588

Hartwig.
Double Position-Angles.

Set.	h_g'	v_1	p	v_2
VI. 17	−0·57	+0·004	2·40	+0·022
XI. 31	− ·55	+ ·007	4·72	+ ·025
XII. 31	− ·38	− ·023	4·72	− ·011

Single Position-Angles.

Set.	Factor of h_g'	v_1	p	v_2
VII. 31	−0·08	+0·129	2·36	+0·132
VIII. 23	+ ·33	+ ·259	2·36	+ ·248
24	+ ·44	− ·001	2·36	− ·015
XI. 30	+ ·62	− ·036	2·36	− ·056

Peter.
Double Position-Angles.

Set.	p'	v_1	p	v_2
II. 12	+0·09	+0·169	1·18	+0·171
VI. 14	+ ·53	− ·011	2·98	·000
IX. 14	− ·19	− ·276	1·18	− ·280
XI. 28	− ·55	+ ·032	2·16	+ ·021
XIII. 30	+ ·05	+ ·022	1·18	+ ·023

Single Position-Angles.

Set.	Factor of p'	v_1	p	v_2
III. 37	−0·59	+0·385	0·47	+0·373
38	− ·51	+ ·288	1·19	+ ·277
40	+ ·41	+ ·217	1·46	+ ·225
V. 23	+ ·03	+ ·295	0·47	+ ·296
VIII. 22	+ ·62	− ·072	1·46	− ·059
XI. 26	+ ·59	+ ·145	0·86	+ ·157
27	+ ·62	− ·233	0·47	− ·220
XIII. 31	+ ·17	+ ·181	0·86	+ ·185
XV. 20	+ ·22	+ ·305	1·19	+ ·310

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Having regard to the weights, the Normals and their solutions are :—

Normals.		Solutions.		
Distances.	Position-Angles.		Weight.	Mean Error.
Auwers.				
$46{\cdot}70\,a - 10{\cdot}58\,\Delta A = -2{\cdot}630$	$18{\cdot}82\,a' = -0{\cdot}634$	$a = -0{\cdot}0562$	46·22	± 0″·0294
$-10{\cdot}58 + 230{\cdot}53 = +0{\cdot}693$		$\Delta A = +0{\cdot}0004$	228·14	± 0·0132
		$a' = -0{\cdot}0337$	19·05	± 0·0391
Gill.				
$42{\cdot}63\,g - 15{\cdot}63\,\Delta G = +0{\cdot}045$	$11{\cdot}66\,g' = +0{\cdot}406$	$g = +0{\cdot}0030$	41·09	± 0·0344
$-15{\cdot}63 + 158{\cdot}68 = +0{\cdot}787$		$\Delta G = +0{\cdot}0052$	152·95	± 0·0178
		$g' = +0{\cdot}0348$	11·66	± 0·0596
Elkin.				
$7{\cdot}13\,e + 0{\cdot}63\,\Delta E = +0{\cdot}275$	$5{\cdot}35\,e' = +0{\cdot}372$	$e = +0{\cdot}0360$	7·11	± 0·0625
$0{\cdot}63 + 17{\cdot}74 = +0{\cdot}523$		$\Delta E = +0{\cdot}0282$	17·69	± 0·0396
		$e' = +0{\cdot}0695$	5·35	± 0·0894
Hall.				
$2{\cdot}83\,h + 0{\cdot}26\,\Delta H = +0{\cdot}202$	$1{\cdot}26\,h' = -0{\cdot}180$	$h = +0{\cdot}0750$	2·83	± 0·1122
$0{\cdot}26 + 18{\cdot}73 = -0{\cdot}765$		$\Delta H = -0{\cdot}0419$	18·71	± 0·0436
		$h' = -0{\cdot}1435$	1·25	± 0·1662
Peter.				
$13{\cdot}62\,p + 0{\cdot}87\,\Delta P = +2{\cdot}142$	$3{\cdot}41\,p' = -0{\cdot}070$	$p = +0{\cdot}1568$	13·60	± 0·0502
$0{\cdot}87 + 37{\cdot}82 = +0{\cdot}388$		$\Delta P = +0{\cdot}0067$	37·77	± 0·0301
		$p' = -0{\cdot}0206$	3·41	± 0·1157
Schur.				
$3{\cdot}64\,s + 1{\cdot}11\,\Delta S = -0{\cdot}028$	$1{\cdot}10\,s' = +0{\cdot}025$	$s = -0{\cdot}0093$	3·58	± 0·0991
$1{\cdot}11 + 18{\cdot}50 = +0{\cdot}086$		$\Delta S = +0{\cdot}0052$	18·16	± 0·0440
		$s = +0{\cdot}0225$	1·10	± 0·2150

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Normals.		Solutions.		
Distances.	Position-Angles.		Weight.	Mean Error.
Hartwig.				
$2{\cdot}81\,h_g - 0{\cdot}67\,\Delta H_g = +0{\cdot}676$	$4{\cdot}50\,h_g' = +0{\cdot}144$	h_g	$+0{\cdot}2486$	$2{\cdot}76$	$\pm 0''{\cdot}1254$
$-0{\cdot}67 + 8{\cdot}65 = +0{\cdot}129$		ΔH_g	$-+0{\cdot}0342$	$8{\cdot}49$	$\pm 0{\cdot}0715$
		h_g'	$=+0{\cdot}0320$	$4{\cdot}50$	$\pm 0{\cdot}0858$

	Distances.						Position-Angles.					
	$[p\,vv]$		$\epsilon^2 = \frac{[p\,vv]}{n-m}$		Mean Error of an observation of weight *unity*.		$[p\,vv]$		$\epsilon^2 = \frac{[p\,vv]}{n-m}$		Mean Error of an observation of weight *unity*.	
	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.
					″	″					″	″
Auwers ...	1·8946	1·7436	0·0412	0·0396	± 0·203	± 0·199	0·8058	0·7848	0·0288	0·0291	± 0·170	± 0·171
Gill	1·8521	1·8478	0·0463	0·0486	± 0·215	± 0·220	1·1726	1·1578	0·0404	0·0414	± 0·201	± 0·203
Elkin	0·8574	0·8326	0·0268	0·0278	± 0·164	± 0·167	1·0107	0·9850	0·0421	0·0428	± 0·205	± 0·207
Hall	0·4383	0·3917	0·0337	0·0356	± 0·184	± 0·189	0·4050	0·3797	0·0338	0·0345	± 0·184	± 0·186
Peter	1·2300	0·8906	0·0439	0·0343	± 0·210	± 0·185	0·5949	0·5931	0·0425	0·0456	± 0·206	± 0·213
Schur	0·6687	0·6689	0·0318	0·0352	± 0·178	± 0·188	0·5595	0·5588	0·0466	0·0508	± 0·216	± 0·225
Hartwig...	0·3024	0·1302	0·0605	0·0434	± 0·246	± 0·208	0·2031	0·1985	0·0290	0·0331	± 0·170	± 0·182

Of these personal errors, p is the only one whose reality seems quite certain, the mean error of its determination being less than one third of the amount of the term; the value of a is also determined with considerable certainty, viz., $a = -0{\cdot}056$ with *mean error* $\pm 0{\cdot}029$. With these two exceptions the personal corrections might reasonably be regarded as purely accidental in origin. The corrections ΔA, ΔG, &c., are merely outstanding corrections to large terms depending on the reciprocal of the distance, the original values of these terms having been determined at an earlier stage of the work. The changes produced upon the individual values of $\Delta' x''$ and $\Delta' y''$ and z by the introduction of the equivalents of ΔA, ΔG, ΔE, ΔH, ΔP, ΔS and ΔH_g, are quite insensible.

With regard to the personal terms generally, the introduction of their numerical equivalents has a very trifling influence on the values of $\Delta' x''$ and $\Delta' y''$ from the different groups.

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Thus, the corrections corresponding to the various groups on account of their personal errors are :—

Group.	$\Delta''x''$ Solutions.		Mean.	$\Delta''y''$ Solutions.		Mean.
	A	B		A	B	
	"	"	"	"	"	"
II.	—0·015	—0·015	—0·015	+0·019	+0·019	+0·019
III.	— ·014	— ·016	— ·015	+ ·012	+ ·011	+ ·011
IV.	— ·030	— ·030	— ·030	+ ·004	+ ·004	+ ·004
V.	+ ·003	+ ·034	+ ·018	— ·001	— ·011	— ·006
VI.	— ·014	— ·046	— ·030	+ ·002	— ·024	— ·011
VII.	— ·003	+ ·007	+ ·002	— ·001	— ·004	— ·002
VIII.	+ ·009	+ ·004	+ ·006	— ·004	·000	— ·002
IX.	+ ·002	+ ·002	+ ·002	+ ·004	+ ·004	+ ·004
X.	+ ·010	+ ·005	+ ·007	— ·003	— ·007	— ·005
XI.	— ·001	— ·001	— ·001	— ·001	— ·001	— ·001
XII.	+ ·011	— ·003	+ ·004	+ ·002	+ ·001	+ ·001
XIII.	— ·005	·000	— ·002	— ·005	— ·001	— ·003
XIV.	— ·004	— ·004	— ·004	— ·002	— ·004	— ·003
XV.	— ·010	— ·006	— ·008	+ ·001	·000	·000

and these corrections have no sensible influence on the value of $\Delta\mu$.

The definitive residuals, entered as such in the right-hand column beside the equations (pp. 476–489), are therefore identical with the figures in column v_1 except that in the cases of Auwers' and Peter's observations of distance the results are corrected for the personal errors a and p.

It may not unreasonably be assumed that the personal errors depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$ should be identical, or, in other words, that the same observer would have the same mean period of hesitancy in noting time when observing position-angles as when observing distances. There is certainly a distinct difference in the two processes of manipulation which *may* lead to a difference in the value of the two constants for the same observer; also there is a fair amount of probability that both constants are really identical, but for no observer are both constants determined with sufficient weight to afford material evidence for or against such a hypothesis.

Therefore, if we put $a' = a$; $g' = g$, &c., we get*

	Mean Error.		Mean Error.
$a = -0{\cdot}050$	$\pm 0{\cdot}025$	$p = +0{\cdot}121$	$\pm 0{\cdot}048$
$g = +0{\cdot}010$	$\pm \cdot 027$	$s = -0{\cdot}002$	$\pm \cdot 092$
$e = +0{\cdot}050$	$\pm \cdot 057$	$h_g = +0{\cdot}114$	$\pm \cdot 074$
$h = +0{\cdot}008$	$\pm \cdot 099$		

* These values have been computed by combining the values of a with a', of g with g', &c., having regard to their weights, the *mean errors* from the combined weights on the assumption that the *mean error* of an observation of weight *unity* is $\pm 0''{\cdot}200$.

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These constants, so far as they may be real, represent either a personal habit in noting the time of instrumental bisection of the star and planet (see pp. 461–465), or errors in the longitudes of the observing stations. Of course the latter hypothesis is in the last degree improbable, but if we assume that the longitudes are accurately known, it is at least interesting to examine how far the longitudes thus computed differ from the true longitudes.

The mean motion of the Moon is about 0·8 seconds of arc in a second of time; the mean motion of *Victoria* during its opposition in 1889 was less than 0″·008 in the same interval. The available *Victoria* factor for longitude determination is therefore less than one hundredth part of the Lunar one, that is to say, the method has 100^2 or *ten thousand times* less geometrical weight.

Remembering that the unit of t in the expressions $\frac{ds}{dt}$ and $\frac{dp}{dt}$ is $\frac{1}{1000}$ of a day, we obtain the apparent corrections to the longitudes of the stations, expressed in seconds of time, by multiplying the values of a, g, e, &c., by 86·4 (the number of seconds of time in $\frac{1}{1000}$ of a day).

Hence

				Mean Error.
For the Cape ...	... by Auwers' observations, we have	$\Delta\lambda$	$= -$	$4^s{\cdot}3 \pm 2^s{\cdot}2$
„ „ ...	... „ Gill's „ „ „		$= +$	$0{\cdot}8 \pm 2{\cdot}4$
„ Yale ...	... „ Elkin's „ „ „		$= +$	$4{\cdot}3 \pm 4{\cdot}9$
„ „ ...	... „ Hall's „ „ „		$= +$	$0{\cdot}7 \pm 8{\cdot}6$
„ Leipzig	... „ Peter's „ „ „		$= +$	$10{\cdot}4 \pm 4{\cdot}2$
„ Göttingen	... „ Schur's „ „ „		$= -$	$0{\cdot}2 \pm 7{\cdot}9$
„ Bamberg	... „ Hartwig's „ „ „		$= +$	$9{\cdot}8 \pm 6{\cdot}4$

These apparent errors, the cases of Leipzig and Bamberg perhaps excepted, barely exceed those which modern telegraphic operations have shewn to exist in some terrestial longitudes previously determined by long series of Moon culminations and occultations.

That such results should be possible from sheer accuracy of the methods employed, and in spite of overwhelming odds in the unfavourable character of the geometrical conditions, may perhaps be accepted as an apt illustration of the general precision of the work.

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CHAPTER VII.

DETERMINATION OF THE DEFINITIVE VALUES OF THE "MEAN SOLAR PARALLAX," AND OF THE "CONSTANT OF THE LUNAR PERTURBATION OF THE EARTH" FROM THE OBSERVATIONS OF *VICTORIA*.

Having regard to the *true* weights, (p. 515) and the values of z (p. 509), we obtain the mean value of z in terms of the symbolical corrections.

SOLUTION A.

$$
\begin{array}{llllllll}
z = +0{\cdot}0058 & -0{\cdot}0132\,\Delta\mu' & & & & & & \\
 & +0{\cdot}0374\,\Delta A & +0{\cdot}0267\,\Delta G & +0{\cdot}0025\,\Delta E & -0{\cdot}0071\,\Delta H & -0{\cdot}0233\,\Delta P & -0{\cdot}0108\,\Delta S & -0{\cdot}0140\,\Delta H_g \\
 & +0{\cdot}0283\,a & -0{\cdot}0224\,g & -0{\cdot}0162\,e & -0{\cdot}0052\,h & -0{\cdot}0188\,p & -0{\cdot}0049\,s & +0{\cdot}0030\,h_g \\
 & -0{\cdot}0101\,a' & +0{\cdot}0006\,g' & +0{\cdot}0001\,e' & -0{\cdot}0007\,h' & -0{\cdot}0050\,p' & -0{\cdot}0026\,s' & +0{\cdot}0216\,h_g'
\end{array}
$$

with the weight 369·1.

Similarly, we have from—

SOLUTION B.

$$
\begin{array}{llllllll}
z = +0{\cdot}0032 & -0{\cdot}0231\,\Delta\mu' & & & & & & \\
 & -0{\cdot}0046\,\Delta A & -0{\cdot}0136\,\Delta G & +0{\cdot}0064\,\Delta E & -0{\cdot}0004\,\Delta H & +0{\cdot}0045\,\Delta P & +0{\cdot}0011\,\Delta S & \pm 0{\cdot}0000\,\Delta H_g \\
 & +0{\cdot}0431\,a & +0{\cdot}0191\,g & +0{\cdot}0192\,e & -0{\cdot}0022\,h & -0{\cdot}0350\,p & -0{\cdot}0096\,s & -0{\cdot}0040\,h_g \\
 & -0{\cdot}0184\,a' & +0{\cdot}0002\,g' & -0{\cdot}0040\,e' & -0{\cdot}0007\,h' & -0{\cdot}0057\,p' & -0{\cdot}0037\,s' & +0{\cdot}0246\,h_g'
\end{array}
$$

with the weight 271·9.

Substituting the known values of the personal terms (pp. 522, 523), we get the following corrected values of z :—

SOLUTION A.

	$z = +0{\cdot}0058$	$-0{\cdot}0132\,\Delta\mu'$
Correction for ΔA, ΔG, &c.	$-\ {\cdot}00017$	
,, ,, a, g, &c. ...	$-\ {\cdot}00408$	
,, ,, a', g', &c. ...	$+\ {\cdot}00115$	
Corrected value.....	$z = +0{\cdot}0027$	$-0{\cdot}0132\,\Delta\mu'$

SOLUTION B.

	$z = +0{\cdot}0032$	$-0{\cdot}0231\,\Delta\mu'$
Correction for ΔA, ΔG, &c.	$+\ {\cdot}00022$	
,, ,, a, g, &c. ...	$-\ {\cdot}00979$	
,, ,, a', g', &c. ...	$+\ {\cdot}00118$	
Corrected value.....	$z = -0{\cdot}0052$	$-0{\cdot}0231\,\Delta\mu'$

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If only the personal terms a and p are regarded as real (see p. 523), we have—

	From Solution A.	From Solution B.
	$z = +0{\cdot}0058$	$+0{\cdot}0032$
Correction for a.....	$-\ {\cdot}00159$	$-\ {\cdot}00242$
" " p.....	$-\ {\cdot}00295$	$-\ {\cdot}00549$
z corrected	$= +0{\cdot}0015$	$-0{\cdot}0047$

values which, for all practical purposes, are identical with those derived on the hypothesis that *all* the personal corrections are real.* The separate values of z for the two solutions, corrected and uncorrected for personal errors, are—

Group.	Solution A.				Solution B.			
	Uncorrected.	Corrected for all personal errors.	Corrected for a and p only.	True weight.	Uncorrected.	Corrected for all personal errors.	Corrected for a and p only.	True weight.
I.	$-0{\cdot}067$	$-0{\cdot}069$	$-0{\cdot}067$	0·9	$-0{\cdot}067$	$-0{\cdot}069$	$-0{\cdot}067$	0·9
II.	$+\ {\cdot}007$	$-\ {\cdot}045$	$-\ {\cdot}039$	15·3	$+\ {\cdot}007$	$-\ {\cdot}045$	$-\ {\cdot}039$	15·3
III.	$+\ {\cdot}028$	$+\ {\cdot}005$	$+\ {\cdot}009$	21·2	$+\ {\cdot}050$	$+\ {\cdot}036$	$+\ {\cdot}041$	15·0
IV.	$+\ {\cdot}088$	$+\ {\cdot}032$	$+\ {\cdot}047$	36·8	$+\ {\cdot}088$	$+\ {\cdot}032$	$+\ {\cdot}047$	36·8
V.	$-\ {\cdot}019$	$-\ {\cdot}035$	$-\ {\cdot}031$	9·9	$-\ {\cdot}028$	$-\ {\cdot}037$	$-\ {\cdot}036$	9·6
VI.	$+\ {\cdot}046$	$+\ {\cdot}049$	$+\ {\cdot}047$	21·3	$+\ {\cdot}002$	$-\ {\cdot}026$	$-\ {\cdot}021$	12·2
VII.	$-\ {\cdot}021$	$-\ {\cdot}016$	$-\ {\cdot}023$	30·7	$-\ {\cdot}013$	$-\ {\cdot}021$	$-\ {\cdot}019$	23·5
VIII.	$+\ {\cdot}037$	$+\ {\cdot}056$	$+\ {\cdot}043$	30·1	$+\ {\cdot}037$	$+\ {\cdot}041$	$+\ {\cdot}037$	15·6
IX.	$-\ {\cdot}066$	$-\ {\cdot}081$	$-\ {\cdot}080$	18·6	$-\ {\cdot}066$	$-\ {\cdot}081$	$-\ {\cdot}080$	18·6
X.	$+\ {\cdot}048$	$+\ {\cdot}032$	$+\ {\cdot}032$	15·7	$-\ {\cdot}078$	$-\ {\cdot}062$	$-\ {\cdot}078$	5·0
XI.	$-\ {\cdot}022$	$-\ {\cdot}008$	$-\ {\cdot}013$	57·3	$-\ {\cdot}013$	$+\ {\cdot}001$	$-\ {\cdot}005$	51·8
XII.	$-\ {\cdot}006$	${\cdot}000$	$-\ {\cdot}008$	32·0	$-\ {\cdot}050$	$-\ {\cdot}041$	$-\ {\cdot}050$	15·9
XIII.	$+\ {\cdot}012$	$+\ {\cdot}027$	$+\ {\cdot}026$	38·5	$+\ {\cdot}013$	$+\ {\cdot}021$	$+\ {\cdot}020$	26·2
XIV.	$-\ {\cdot}015$	$+\ {\cdot}003$	$+\ {\cdot}001$	28·0	$+\ {\cdot}005$	$+\ {\cdot}025$	$+\ {\cdot}022$	21·3
XV.	$-\ {\cdot}086$	$-\ {\cdot}084$	$-\ {\cdot}088$	12·8	$-\ {\cdot}127$	$-\ {\cdot}121$	$-\ {\cdot}127$	4·2
Mean value of z	$+0{\cdot}0058$	$+0{\cdot}0027$	$+0{\cdot}0015$		$+0{\cdot}0032$	$-0{\cdot}0052$	$-0{\cdot}0047$	
$\frac{[p\,vv]}{n-1}$	0·0464	0·0355	0·0364		0·0421	0·0284	0·0325	
Mean error of z*	$\pm 0{\cdot}0126$	$\pm 0{\cdot}0096$	$\pm 0{\cdot}0099$		$\pm 0{\cdot}0155$	$\pm 0{\cdot}0104$	$\pm 0{\cdot}0120$	

* If we regard $a' = a$, $g' = g$, &c., and substitute the values of a, g, e, &c., determined on this hypothesis (see page 524), we get—

		Solution A.	Solution B.
z (corrected for a, g, e, h, p, s, and h_g)	=	$+0{\cdot}0038$	$-0{\cdot}0016$
z (corrected for a and p only)	=	$+\ {\cdot}0021$	$-\ {\cdot}0030$

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To estimate independently the Probable Errors of these determinations we have the following data :—

	[p vv] uncorrected for Personal terms depending on $\frac{ds}{dt}$ or $\frac{dp}{dt}$	εε	Corresponding Mean Error of an Observation of Weight Unity.	n = No. of Sets of Observations.	[p vv] corrected for Personal terms depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$	εε	Corresponding Mean Error of an Observation of Weight Unity.
Double Distances.							
Auwers	0·9819	0·0393	± 0·198	25	0·8558	0·0357	± 0·189
Gill	·9563	·0455	·213	21	·9585	·0479	·219
Elkin	·4064	·0239	·155	17	·3956	·0247	·157
Hall	·1585	·0317	[·178]	5	·2012	·0503	[·224]
Peter	·7732	·0430	·207	18	·4926	·0290	·170
Schur	·3299	·0330	·182	10	·3309	·0368	·192
Hartwig	·1648	...	...	1	·0370	...	...
Single Distances.							
Auwers	0·9127	0·0456	± 0·214	21	0·8878	0·0467	± 0·216
Gill	·8958	·0498	·223	19	·8893	·0523	·229
Elkin	·4510	·0322	·179	15	·4370	·0336	·183
Hall	·2798	·0400	·200	8	·1905	·0317	[·178]
Peter	·4568	·0508	·225	10	·3980	·0498	·223
Schur	·3388	·0339	·184	11	·3380	·0376	·194
Hartwig	·1376	·0459	[·214]	4	·0932	·0466	[·216]
Double Position-Angles.							
Auwers	0·2059	0·0229	± 0·151	9	0·2111	0·0264	± 0·162
Gill	·4506	·0410	·202	11	·4363	·0436	·209
Elkin	·2258	·0452	[·213]	5	·1927	·0482	[·220]
Hall	·0752	·0251	[·158]	3	·0665	·0333	[·182]
Peter	·1267	·0253	[·159]	5	·1285	·0321	[·179]
Schur	·1611	·0537	[·232]	3	·1540	·0770	[·277]
Hartwig	·0024	·0008	[·028]	3	·0045	·0022	[·047]
Single Position-Angles.							
Auwers	0·5999	0·0316	± 0·178	19	0·5737	0·0319	± 0·179
Gill	·7220	·0401	·200	18	·7215	·0424	·206
Elkin	·7849	·0413	·203	19	·7923	·0440	·210
Hall	·3298	·0366	·191	9	·3132	·0391	·198
Peter	·4682	·0520	·228	9	·4646	·0581	·241
Schur	·3984	·0443	·210	9	·4048	·0506	·225
Hartwig	·2007	·0502	[·224]	4	·1940	·0647	[·254]
[p vv] = 11·9951		Total No. of Sets = n = 311			11·1631		

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For m (the number of unknowns which enter into the general equations) we have

—	For the Uncorrected Equations.	For the Corrected Equations.
z	1	1
$\alpha, \beta, \gamma, \delta, \alpha', \beta', \gamma', \delta'$	8	8
$\Delta A, \Delta G, \Delta E, \Delta H, \Delta P, \Delta S, \Delta H_g$	7	7
a, g, e, h, p, s, h_g	...	7
$a', g', e', h', p', s', h'_g$	...	7
Value of m	16	30

Therefore—

$$\frac{[p\,vv]}{n-m} = \begin{array}{cc} \text{Uncorrected.} & \text{Corrected.} \\ 0{\cdot}0406 & 0{\cdot}0397 \end{array}$$

and the *mean error* of an observation of weight *unity*

$$= \pm\ 0''{\cdot}201 \qquad \pm\ 0''{\cdot}199$$

These values are in sufficient agreement with an estimated *mean error* $= \pm 0''{\cdot}200$, which was assumed as the basis of the system of weights.

In the computation of the *mean error* of an observation of weight *unity* for each class of measures by each of the different observers, the value of $[p\,vv]$ derived from each particular class has been divided by n *minus* "*the number of personal terms which enter into the corrections of that class.*" The double distances are assumed to be practically unaffected by the terms depending on the reciprocal of the distance. Thus the divisor n is diminished as follows :—

—	Uncorrected.	Corrected.
For the Double Distances	by 0	by 1 (*i.e.*, by a, &c.)
„ Single „	„ 1 (*i.e.*, by A, &c.)	„ 2 („ „ A and a, &c.)
„ Double Position-Angles	„ 0	„ 1 („ „ a', &c.)
„ Single „	„ 0	„ 1 („ „ a', &c.)

The results thus obtained are not strictly accurate, as the diminution of the value of $[p\,vv]$ for each observer by the introduction of the terms α, β, γ, δ, α', β', γ', and δ' for the correction of the Ephemeris must be slightly greater than if the absolute errors of the Ephemeris had been independently known; on the other hand, the same unknown a or g, &c. enters both into the double and single distances, as also do a' or g', &c. into both the double and single position-angles, and thus the computed

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errors (in the case of the corrected series) come out a little too large. The very small inaccuracies arising from these causes are, however, of no consequence in estimating the justice of the weights which have been assigned to the different observers.

It appears clearly that injustice has been done to Elkin's observations (the matter has since been traced to a clerical error in the preparation of the factors of the weights), and that, if a new solution were made, the weights of the equations resulting from his observations of double distances should be multiplied by 1·6, and those from his single distances by 1·2. The weights of Schur's distances should be multiplied by about 1·2, and those of his position-angles by 0·9. The weights of Peter's single distances should be multiplied by 0·8, and on the other hand the weight of his observations of double distances (at least if the correction p is accepted as real) should be increased. The weights of Gill's distances should be multiplied by 0·85, those of Auwer's single position-angles by 1·3.

The residuals of Auwer's double position-angles are so remarkably small that were their weights further increased to correspond with their apparent *mean errors*, the corresponding *mean errors* of the heaviest weighted equations would become smaller than the tabular *mean error* due to the star-places; that is to say, the estimated error of the Heliometer observations would become less than Zero !! This result is one of those fortuitous conditions which arise from time to time in all discussions of the kind when observations are not sufficiently numerous, and the various sources of error have so combined as to destroy each other, just as in other cases they sometimes combine with an opposite result. On the whole, apart from the regrettable error in the case of Elkin's distances, the representation of the weights of the different observers may be regarded as sufficiently satisfactory.

A further partial but completely convincing investigation has shown that the changing of the weights above indicated produces no sensible change either on the resulting parallax or on the value of μ'.

It remains for consideration how far this discussion throws light upon the reality or otherwise of the personal terms depending upon $\frac{ds}{dt}$ and $\frac{dp}{dt}$. Although the introduction of these terms reduces $[p\,vv]$ from 11·9951 to 11·1631, yet, when the divisor of $[p\,vv]$ is diminished by the additional number of unknown quantities the resulting square of the mean error of an observation of weight unity comes out only very slightly smaller than the corresponding value when these corrections are not included.

On the other hand (as shown at p. 527) the agreement of the 15 separate results for parallax becomes very materially improved by the introduction of the corrections in question.

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At the same time it is shown that an almost equal improvement in the agreement of the parallax results is found if we consider that none of the personal corrections are real except a and p, the latter terms (as shown at p. 522) being determined with *mean errors* corresponding respectively to half and one third of their amounts. The increase of the mean error of an observation of weight unity, produced in all other cases by the introduction of the terms in question, shows that the fortuitous errors of observation so far exceed the actual corrections depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$ as to give apparent values of these terms which are not real.

Then regarding a and p as real, we get from all the observations

$$[p\,vv] = 11{\cdot}5047\,;\ m = 18\,;\ \frac{[p\,vv]}{n-m} = 0{\cdot}0393\,;$$

and the *mean error* of an observation of weight unity

$$\pm\ 0''{\cdot}198.$$

With regard to the terms depending on the reciprocal of the distance, the original values of A, G, &c. were determined not only without regard to the personal terms depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$ but with preliminary corrections of the Ephemeris in which only terms depending on the first and second powers of the time were included. The very small values of ΔA, ΔG, &c. resulting from the definitive discussion may thus be accepted as proof of the reality and reliability of the values of the terms in question. It is not maintained that the constant of the term depending upon the reciprocal of the distance remains quite unchanged for the same observer under all conditions of distance and of definition, yet that the variations of this term are very limited in their effect on the distances is proved by the smallness of the residuals in the observations of single distances. Such variations are of the character of accidental errors because they enter into the determinations of $\Delta x''$, $\Delta y''$ and z with different factors on different nights, as is proved by the smallness of their co-efficients in the mean expression for z. As their weights have been computed from the residuals, the single distances are, on the above mentioned grounds, entitled to their full weight, and therefore the value of z, from Solution A (which includes all the observations) should be accepted.

With the exception of a and p, which appear to be real, the personal corrections depending on $\frac{ds}{dt}$ and $\frac{dp}{dt}$ have been shown to be fortuitous; the effects of AΔ, ΔG, &c. are entirely insensible affecting the value of z only by $-$ 0·00017, or the value of the parallax by $-$ 0″·00015.

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The definitive solution is therefore derived from Solution A, corrected for a and p only, and the result (*see* p. 527) is

$$z = 0{\cdot}0015 \quad \text{Weight } 369{\cdot}1.$$

The *mean error* of z as deduced from the agreement of the 15 independent results is $\pm$ 0·0099; or, if we adopt the *mean error* due to the weight of z and the *mean error* of an observation of weight unity, derived, at p. 529, from the residuals of the original equations (viz., $\pm$ 0″·200), we have for the *mean error* of $z = \pm$ 0·0104, which we shall adopt as definitive.

According to the formation of our equations of condition we have from all the observations

$$\pi_0 = 8''{\cdot}800 + 0{\cdot}880\, z = \mathbf{8''{\cdot}8013}$$

with the *probable error*

$$\pm\, \mathbf{0''{\cdot}0061}.$$

As a control on the value of the parallax thus derived, and as a crucial test of its probable freedom from systematic error, a further solution was made by the diurnal method—that is to say, by employing the Cape observations only.

Discussed in a precisely similar manner with the foregoing, the following values of z, with their true and apparent weights, were found.

Groups I., II., V., VI. and XIV. were necessarily excluded as they do not afford data for determination of z by the diurnal method.

VALUES OF z.—CAPE OBSERVATIONS ONLY.

Group.	Apparent Weight.	Value of z Uncorrected.	Co-efficients of the Symbolical Corrections in terms of which z is determined.						Value of z Corrected for Personal errors.	True Weight.
			ΔA	ΔG	a	g	a′	g′		
		″							″	
III.	2·95	—0·064	+ ·241	— ·183	+ ·031	+ ·098	+ ·041	— ·153	—0·075	4·7
IV.	2·61	+ ·054	— ·007	+ ·019	— ·416	+ ·397	...	...	+ ·070	3·7
VII.	11·71	— ·011	— ·349	+ ·253	+ ·092	— ·638	+ ·061	— ·072	— ·007	17·7
VIII.	11·57	+ ·114	+ ·079	+ ·077	— ·238	+ ·123	+ ·124	+ ·001	+ ·122	13·0
IX.	5·60	— ·029	+ ·073	— ·156	+ ·156	— ·125	+ ·079	— ·131	— ·043	8·1
X.	9·45	+ ·039	— ·470	+ ·303	+ ·395	— ·257	— ·119	— ·071	+ ·024	11·8
XI.	11·00	+ ·019	— ·177	— ·007	— ·139	— ·009	— ·116	+ ·121	+ ·034	19·3
XII.	15·21	— ·009	+ ·019	+ ·327	+ ·126	— ·115	+ ·107	+ ·024	— ·015	18·9
XIII.	8·02	— ·013	+ ·690	— ·205	+ ·120	— ·144	— ·009	+ ·001	— ·017	13·1
XV.	6·23	— ·116	+ ·018	— ·121	+ ·232	+ ·013	— ·055	— ·035	— ·129	7·8

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Having regard to the weights, we get

$$z = +0{\cdot}0045 - 0{\cdot}024\,\Delta A + 0{\cdot}080\,\Delta G + 0{\cdot}052\,a - 0{\cdot}135\,g + 0{\cdot}011\,a' - 0{\cdot}011\,g'$$

or, correcting for the personal term a, and regarding the others as *zero*, $z = +0{\cdot}0016$, with the weight 118·1.

Taking the *mean error* of an observation of weight unity $= \pm 0''{\cdot}200$, the *mean error* of z becomes $\pm 0{\cdot}0184$, and therefore we have from the Cape Observations only

$$\pi_0 = 8''{\cdot}8014$$

with the *probable error*

$$\pm 0''{\cdot}0108.$$

Thus, although the geometrical conditions resulting from the latitude of the observatory and the declination of the planet are not very favourable for determining parallax by the diurnal method, yet the value of the parallax derived from Cape observations alone has not only a small probable error, *but it agrees in the mean all but absolutely with the value derived from observations in opposite Hemispheres.* No better proof than this could be given of the freedom of the general result from systematic error of observation.

For further discussion of the value of μ', normals were formed in $\Delta\mu'$ in terms of $\Delta' x''$ and $\Delta' y''$, employing the absolute terms of column v_1, that is to say, the observations were corrected for the definitive errors of the Ephemeris. The resulting normals in $\Delta\mu'$ (where $\mu' = 0{\cdot}0633 + \Delta\mu'$) are,—

From Group								
A.	$0{\cdot}88\Delta\mu'$	=	+ 0·26	+ 1·52	$\Delta' x''_{A.}$	+ 0·19	$\Delta' y''_{A.}$
I.	0·83		− 0·46	+ 1·53	$\Delta' x''_{I.}$	− 0·29	$\Delta' y''_{I.}$
II.	2·21		− 0·10	− 4·85	$\Delta' x''_{II.}$	+ 2·91	$\Delta' y''_{II.}$
III.	14·45		− 0·88	− 19·92	$\Delta' x''_{III.}$	− 5·69	$\Delta' y''_{III.}$
IV.	3·04		+ 0·74	+ 2·82	$\Delta' x''_{IV.}$	− 8·58	$\Delta' y''_{IV.}$
V.	6·88		− 0·83	+ 9·86	$\Delta' x''_{V.}$	− 0·07	$\Delta' y''_{V}$
VI.	2·97		− 0·05	+ 4·60	$\Delta' x''_{VI.}$	+ 4·42	$\Delta' y''_{VI.}$
VII.	15·31		− 0·34	− 20·48	$\Delta' x''_{VII.}$	− 0·20	$\Delta' y''_{VII.}$
VIII.	17·22		+ 0·70	− 22·88	$\Delta' x''_{VIII.}$	− 6·85	$\Delta' y''_{VIII.}$
IX.	5·82		+ 0·39	− 8·80	$\Delta' x''_{IX.}$	− 8·98	$\Delta' y''_{IX.}$
X.	1·72		− 0·16	− 0·53	$\Delta' x''_{X.}$	− 5·22	$\Delta' y''_{X.}$
XI.	20·48		− 0·25	+ 29·74	$\Delta' x''_{XI.}$	+ 1·27	$\Delta' y_{XI.}$
XII.	6·21		+ 1·37	+ 12·04	$\Delta' x''_{XII.}$	+ 9·19	$\Delta' y''_{XII.}$
XIII.	11·50		+ 0·11	− 19·47	$\Delta' x''_{XIII.}$	+ 3·47	$\Delta' y''_{XIII.}$
XIV.	5·38		− 0·04	− 8·77	$\Delta' x''_{XIV.}$	− 6·01	$\Delta' y''_{XIV.}$
XV.	2·85		− 0·09	+ 5·78	$\Delta' x''_{XV.}$	− 3·87	$\Delta' y''_{XV.}$

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Expressing $\Delta' x''_{A}$, $\Delta' x''_{I}$, $\Delta' x''_{II}$, &c., in terms of $\Delta\alpha$, $\Delta\beta$, $\Delta\gamma$, and $\Delta\delta$, and similarly expressing $\Delta' y''_{A}$, $\Delta' y''_{I}$, $\Delta' y''_{II}$, &c., in terms of $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma'$, and $\Delta\delta'$ (the coefficients of these terms for each group are given at pp. 500–501), we obtain,—

Group										
A.	$0\cdot88\Delta\mu' =$	$+ 0\cdot26$	$+ 1\cdot55\,\Delta'\alpha$	$- 6\cdot20\,\Delta'\beta$	$+ 24\cdot84\,\Delta'\gamma$	$- 9\cdot94\,\Delta'\delta$	$+ 0\cdot19\,\Delta'\alpha'$	$- 0\cdot78\,\Delta'\beta'$	$+ 3\cdot11\,\Delta'\gamma'$	$- 1\cdot24\,\Delta'\delta'$
I.	0·83	− 0·46	+ 1·59	− 5·91	+ 21·85	− 8·08	− 0·30	+ 1·12	− 4·14	+ 1·53
II.	2·21	− 0·10	− 5·24	+16·30	− 50·54	+15·67	+ 3·14	− 9·78	+30·32	− 9·40
III.	14·45	− 0·88	−22·31	+57·96	−150·60	+39·04	− 6·37	+16·56	−43·02	+11·15
IV.	3·04	+ 0·74	+ 3·27	− 6·20	+ 11·79	− 2·26	− 9·95	+18·88	−35·86	+ 6·86
V.	6·88	− 0·83	+11·73	−14·00	+ 16·86	− 1·97	− 0·08	+ 0·10	− 0·12	+ 0·01
VI.	2·97	− 0·05	+ 5·52	− 3·86	+ 2·71	− 0·18	+ 5·30	− 3·71	+ 2·61	− 0·18
VII.	15·31	− 0·34	−24·78				− 0·24			
VIII.	17·22	+ 0·70	−27·69	− 9·61	− 3·43		− 8·29	− 2·88	− 1·03	
IX.	5·82	+ 0·39	−10·56	− 6·34	− 3·78	− 0·18	−10·78	− 6·47	− 3·86	− 0·18
X.	1·72	− 0·16	− 0·64	− 0·51	− 0·41	− 0·03	− 6·26	− 5·01	− 4·02	− 0·31
XI.	20·48	− 0·25	+35·09	+49·07	+ 68·70	+ 9·52	+ 1·50	+ 2·10	+ 2·93	+ 0·41
XII.	6·21	+ 1·37	+13·85	+27·81	+ 55·62	+11·20	+10·57	+21·23	+42·46	+ 8·55
XIII.	11·50	+ 0·11	−21·81	−56·85	−147·78	−38·36	+ 3·89	+10·13	+26·34	+ 6·84
XIV.	5·38	− 0·04	− 9·47	−30·43	− 97·35	−31·13	− 6·49	−20·85	−66·71	−21·34
XV.	2·85	− 0·09	+ 6·07	+22·48	+ 83·06	+30·75	− 4·06	−15·05	−55·61	−20·59

The sum of these normals gives

$$117\cdot75\ \Delta\mu' = +0\cdot37$$
$$- 43\cdot8\,\Delta'\alpha \quad + 33\cdot7\,\Delta'\beta \quad - 168\cdot5\,\Delta'\gamma \quad + 14\cdot1\,\Delta'\delta$$
$$- 28\cdot2\,\Delta'\alpha' \quad + 5\cdot5\,\Delta'\beta' \quad - 106\cdot6\,\Delta'\gamma' \quad - 17\cdot9\,\Delta'\delta'$$

hence

$$\Delta\mu' = + 0\cdot0031 \text{ (with the mean error } \pm 0''\cdot0184)^*$$
$$- 0\cdot372\,\Delta'\alpha \quad + 0\cdot286\,\Delta'\beta \quad - 1\cdot432\,\Delta'\gamma \quad + 0\cdot120\,\Delta'\delta$$
$$- 0\cdot239\,\Delta'\alpha' \quad + 0\cdot047\,\Delta'\beta' \quad - 0\cdot905\,\Delta'\gamma' \quad - 0\cdot152\,\Delta'\delta'$$

Since the absolute terms of the equations, from which the above value of $\Delta\mu'$ has been derived, have been previously corrected by the Table at page 505, which is computed with the values of μ', $\Delta\alpha$, $\Delta\beta$, &c., $\Delta\alpha'$, $\Delta\beta'$, &c. derived at page 502, the most probable values of $\Delta'\alpha$, $\Delta'\beta$, &c., $\Delta'\alpha'$, $\Delta'\beta'$, &c. are *zero*. The *mean errors* corresponding to the weights of these determinations are—

Weight †		Mean Error *	Weight †		Mean Error *
		″			″
$\Delta'\alpha$	179·2	± 0·0149	$\Delta'\alpha'$	192·5	± 0·0144
$\Delta'\beta$	252·4	± ·0136	$\Delta'\beta'$	304·1	± ·0115
$\Delta'\gamma$	5239·8	± ·0028	$\Delta'\gamma'$	5111·6	± ·0028
$\Delta'\delta$	204·9	± ·0140	$\Delta'\delta'$	218·4	± ·0136

* The *mean error* of an observation of weight *unity* is here assumed $= \pm 0''\cdot200$

† Weight from Solution A (page 502).

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Multiplying these mean errors by their corresponding coefficients in the above expression for $\Delta\mu'$, and taking the sum of the squares of the products, we obtain 0·000085, which added to the square of the mean error of $\Delta\mu'$ due to its apparent weight gives 0·000425, which is the square of the true mean error of $\Delta\mu'$.

Hence

$$\Delta\mu' = +\ 0{\cdot}0031 \text{ with the } \textit{mean error} \pm 0''{\cdot}0206$$

and

$$\mu' = +\ 0{\cdot}0633 + \Delta\mu' = +\ 0{\cdot}0664 \text{ with the probable error } \pm\ 0{\cdot}0137.$$

We have also from page 502,

From Solution A	$\mu' = +\ 0{\cdot}060$ with the *mean error*	$\pm\ 0''{\cdot}0230$††
" " B	$\mu' = +\ 0{\cdot}067$ " "	$\pm\ 0''{\cdot}0270$

Thus the value of μ' derived by forming normals in $\Delta\mu'$ is practically the same as that obtained (page 502) by finding the value of $\Delta x''$ and $\Delta y''$ in terms of μ' from each group. This was anticipated because the coefficients of μ' do not vary very much during the period covered by each group.

It is important however to have found the value of $\Delta\mu'$ in terms of $\Delta\alpha$, $\Delta\beta$, &c. as the expression affords an easy means of discussing the dependence of tne value of μ' upon the form of the development of the errors of the Ephemeris.

For this purpose we may write β for $\Delta\beta$, β' for $\Delta\beta'$, &c. in the expression for $\Delta\mu'$ (page 534) where—

$$\beta \text{ is } = -\ 0{\cdot}0443 + \Delta\beta = -\ 0{\cdot}0380;\ \beta' = +\ 0{\cdot}0338 + \Delta\beta' = +\ 0{\cdot}0266$$

(*see* pp. 473 and 502), and similarly—

$$\gamma = -\ 0{\cdot}0026;\ \gamma' = -\ 0{\cdot}0079;\ \delta = +\ 0{\cdot}0079;\ \text{and } \delta' = -\ 0{\cdot}0371.$$

If these values of δ and δ', of γ and γ', and of β and β' are successively substituted with changed sign in the expression for $\Delta\mu'$, we obtain successively the effect on the computed values of μ' of omitting terms in the development of the errors of the Ephemeris depending respectively on t^3, t^2 and t.

†† These *mean errors* depend on the assumption of a *mean error* of $\pm\ 0''{\cdot}200$ for weight *unity* and the weights of μ', viz., 75·5 and 54·9, derived from the Solutions A and B respectively. If derived from the residuals (page 503) the *mean error* is considerably smaller (*see* page 502).

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We thus find

	Effect on the Computed Value of μ'.
By omitting δ and δ', that is omitting terms in t^3	+ 0·0047
" " γ and γ' " " " t^2	− ·0108
" " β and β' " " " t	+ ·0097
Total effect of the empiric terms depending on powers of the time upon the resulting value of μ'	+ 0·0036

Thus, *for all practical purposes, and far within the limits of the probable error of its determination, the resulting value of μ' is entirely independent of all the empirical corrections applied to the Ephemeris.*

We therefore adopt as definitive

$$\mu' = +\ 0{\cdot}0564, \text{ with the } \textit{probable error} \pm 0{\cdot}0137,$$

where the factor of μ' is $\frac{1}{10}$th of the effect of the Lunar Perturbation on the absolute term of the equation ; or, in other words, it denotes *the number of tenth parts that the tabular value of the Lunar Perturbation of the Earth has to be increased.*

The formulæ by which these perturbations were computed are given at pages 440–441 ; and, provided that we consider the Tabular Values of the Lunar Parallaxes taken from the *Berliner Jahrbuch* to be exact (as is almost certainly the case within $\frac{1}{5000}$ part of their amounts), it will be seen from the formulæ (*loc. cit.*) that the computed perturbation may be written in the form

$$f\ \kappa_0$$

where f is a factor depending on the true values of the Lunar Parallax, the true Longitudes and Latitudes of the Sun and Moon, the Radius Vector of the Earth, the distance (Δ) of Victoria (the two latter being reckoned unity when equal to the mean tabular distance of the Earth from the Sun), and other functions which are accurately known.

According to our definition of μ' the true value of our constant will be

$$\kappa = \kappa_0 \left(1 + \tfrac{1}{10}\mu'\right)$$

consequently

$$\frac{M}{1 + M}\pi_0 = \frac{m'}{m + m'}\pi'_0 \left(1 + \tfrac{1}{10}\mu'\right)$$

or

$$\frac{M}{1 + M} = \frac{\kappa_0}{\pi_0}\left(1 + \tfrac{1}{10}\mu'\right) \quad \ldots \quad \ldots \quad \text{A}$$

where

M is the true Mass of the Moon, that of the Earth being *unity*,

and

π_0 is the true value of the Mean Solar Parallax.

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Substituting

$$\pi_0 = 8''\cdot800 + \Delta\pi_0$$

also, as derived above,

$$\mu' = + 0\cdot0664 \pm 0\cdot0137$$

and the tabular value

$$\text{Log. } \kappa_0 = [9\cdot02413 - 10]$$

and putting

$$\mu_{,} = \frac{1}{M} + 1 = \frac{1 + M}{M}$$

we derive

$$\mu_{,} = \mathbf{82\cdot693} \pm 0\cdot082 + 9\cdot40\ \Delta\pi_0$$

or for the Mass of the Moon

$$\mathbf{M = 1 \div (81\cdot693} \pm 0\cdot082 + 9\cdot40\ \Delta\pi_0).$$

The true value of the Perturbation of the Sun's Geocentric Place, due to the revolution of the centre of the Earth around the centre of gravity of the Earth and Moon, is therefore

$$dr = \kappa\ \frac{\cos s' \cos (\nu' - \odot)}{\sin Q}$$

$$rd\nu = \kappa\ \frac{\cos s' \sin (\nu' - \odot)}{\sin Q}$$

$$rds = \kappa\ \frac{\sin s'}{\sin Q}$$

where

$$\kappa = 0\cdot10642, \textit{ probable error } \pm 0\cdot00014\ ;$$

$$\text{Log. } \kappa = [9\cdot02702]$$

ν and ν' are the true Longitudes of the Sun and Moon respectively.

s and s' „ „ Latitudes „ „ „ „

r is the Earth's radius-vector.

Q is the Moon's true Parallax.

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The accompanying diagram (Plate IV.) shows at a glance the strong evidence upon which the present determination of the Lunar Perturbation rests.

The thick curved line in the upper half of the diagram shows the computed correction applicable to the Right Ascensions of Ephemeris II. for any epoch covered by the observations. The curve has been constructed from corrections computed for every second day by the expressions

$$\Delta \alpha \cos \delta = x'' + \Delta x'' + \frac{l_x}{10} \mu' ; \quad \Delta \delta = y'' + \Delta y'' + \frac{l_y}{10} \mu'$$

the values of x'' and y'' being taken from the Table, page 475; and those of $\Delta x'' + \frac{l_x}{10} \mu'$ and $\Delta y'' + \frac{l_y}{10} \mu'$ from the Table, page 504.

The corrections according to Leverrier's Lunar Equation may be found by adding to the correction derived as above the further corrections

$$d \Delta \alpha \cos \delta = 0 \cdot 1403 \frac{l_x}{10} ; \quad d \Delta \delta = 0 \cdot 1403 \frac{l_y}{10}$$

the values of the Factors $\frac{l_x}{10}$ and $\frac{l_y}{10}$ being given for every day in the Table, page 475.

The thin curved line represents the same formula when Leverrier's value $L = 6''\cdot 50$ is substituted.

The values of $\Delta \alpha \cos \delta$ as derived by observation for the epoch of each group, are indicated by crosses (+); the radii of the circles surrounding these crosses represent the *mean errors* of the respective instrumental determinations—the areas of these circles are therefore inversely proportional to the weights of the observations. The brackets at the top of the diagram are numbered to correspond with the groups of observation, and the lengths of the brackets denote the range of dates over which the observations of each group extend. The lower half of the diagram shows similarly the computed and observed values of the corrections in Declination.

In the vertical scale $\frac{1}{2}$ an inch is $= 0''\cdot 10$.
In the horizontal scale $\frac{1}{2}$ an inch is $= 5$ days.

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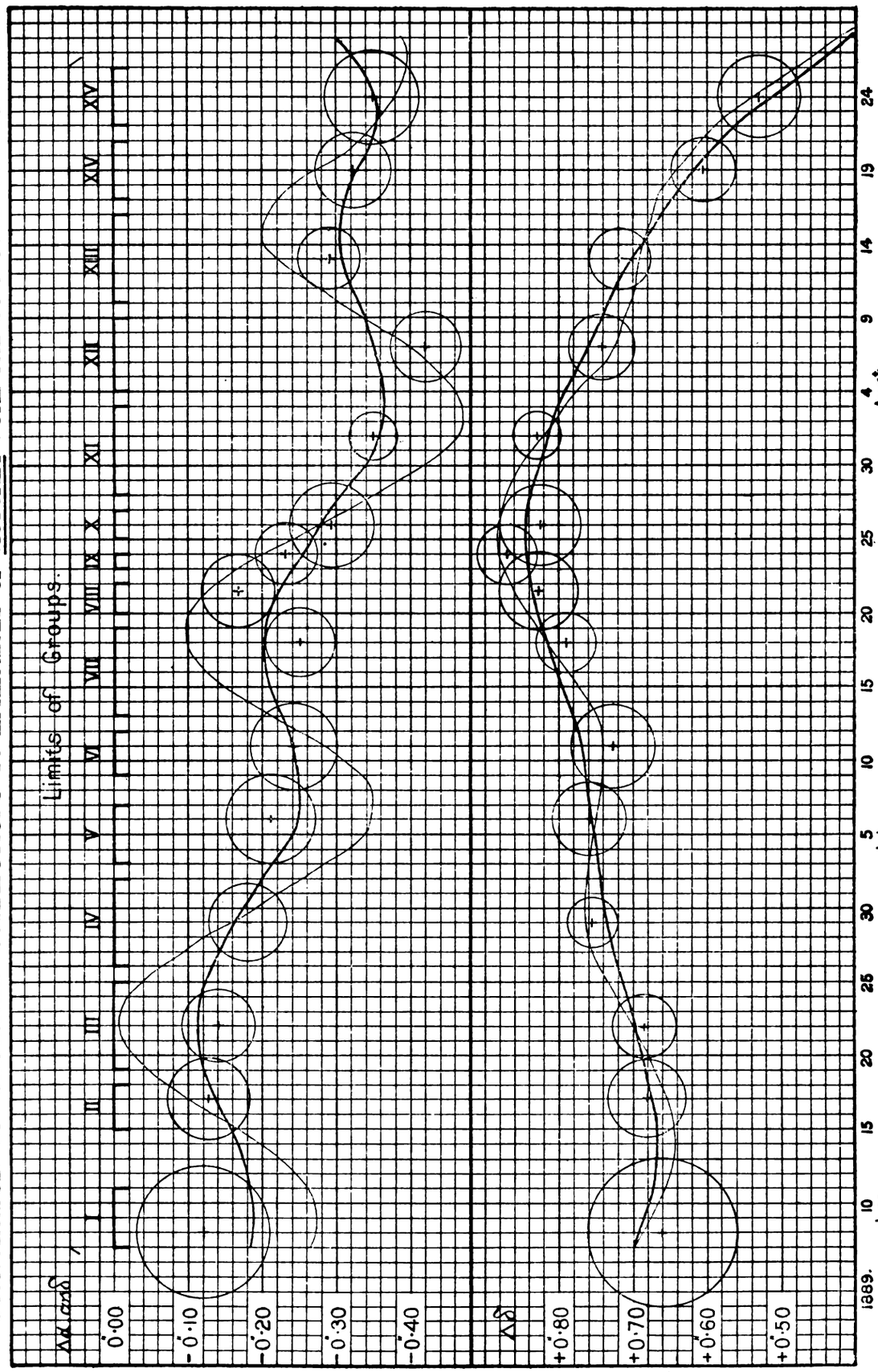
Plate IV.

COMPARISON OF OBSERVED CORRECTIONS TO EPHEMERIS OF VICTORIA WITH THE COMPUTED CORRECTIONS.



Observed values for epochs of Groups are represented by cross lines, thus +,
The radii of circles surrounding crosses represent the mean error of each observed result
The thick curved lines represent the correction in R.A and Dec. computed with L = 6″·41.
The thin curved lines represent the same correction computed with L = 6″·50 *(Leverrier's Value)*

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VOL. I., PART 3.

DISCUSSION

OF THE

OBSERVATIONS OF SAPPHO,

BY

DAVID GILL.

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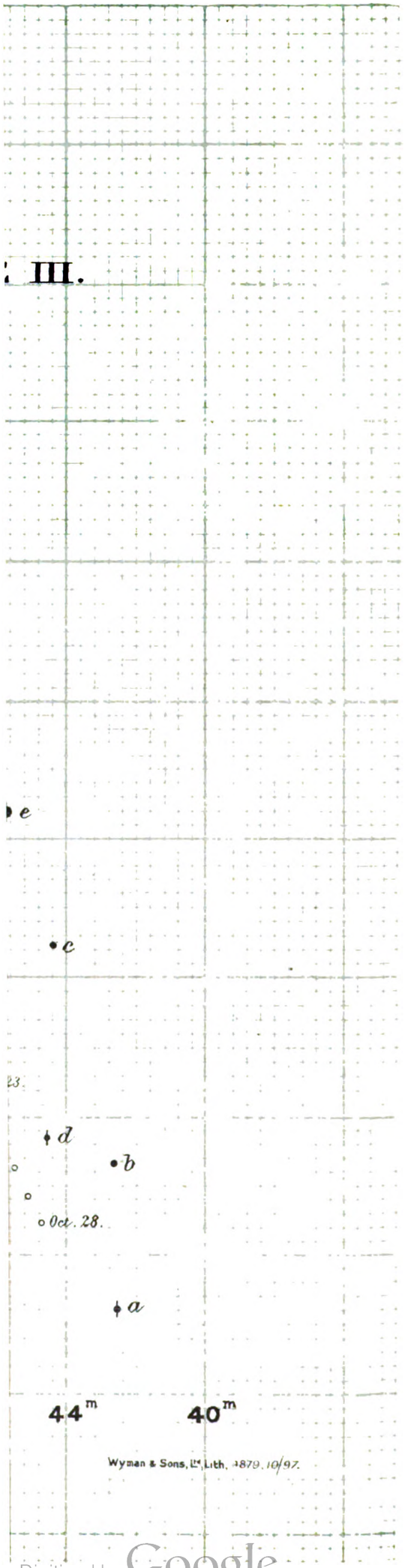
III.



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DISCUSSION OF THE OBSERVATIONS OF SAPPHO.

INTRODUCTION.

In preparing the *Sappho* programme my intention was that the observations should consist, as far as possible, of measures of distance from stars on opposite sides of the planet and situated as symmetrically as possible with respect to it

Because of the faintness of *Sappho* the observations were limited to 17 days before and 24 days after opposition, the closer limitation in the former case being due to the absence of suitable stars in the required region of the sky.

The rapid motion of the planet in Declination, and its comparatively slow motion in Right Ascension, imposed a limit on the number of comparison stars, because, within such narrow range of Right Ascension, the list might easily become too large for observation with meridian instruments in a single season, or at least might have occupied the co-operating meridian observatories on too many nights, if the required number of observations of a larger list of stars had to be secured. It was also desirable that the same comparison stars should be selected for use on two or three successive nights, so as to increase the probability that observations of the planet referred to the same pair of stars would be secured on one or more nights in both hemispheres. For both these reasons it sometimes happens that a pair of stars might have been found for use on particular occasions more favourably situated than the pair named in the programme.

No provision could be made for the execution of a heliometer-triangulation of the comparison stars, like that carried out in the case of *Victoria;* hence, for *Sappho*, the parallax was to be determined solely from *the difference of two opposite distances* when this difference is observed *relative to the same pair of stars* from opposite hemispheres.

The object of the meridian observations of the *Sappho*-stars was to furnish places sufficiently exact for determining the error of the tabular motion of the planet, and for determining, from the *sum* of two opposite distances, the heliometer scale-value applicable to the *difference* of the distances ; but there was no intention of regarding the star places as sufficiently exact to furnish *absolute* positions of the planet for parallax, &c., according to the method followed in the case of *Victoria*.

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The considerable personal corrections to which heliometer-measures of very short single distances are liable was not realized at the time when the *Sappho* programme was arranged, so that I did not hesitate to propose several measures of single distances. But the observations of *Sappho* afford no independent determination of these corrections; and, as *Sappho* is much fainter than *Victoria*, it is possible that, in small distances, the systematic corrections may be very sensibly different from those obtained for *Victoria* (*see* p. 456). On this account it is necessary to exclude the single distances from the parallax determination; but, indeed, there are only the observations on October 4 on which single distances from the same star were observed in both hemispheres. Only on October 4 are there observed position-angles from the same star or stars in both hemispheres; as the distances on that date are not available, and as the change of position-angle is very rapid and the observations in opposite hemispheres are not simultaneous, the error of the star's place cannot be eliminated from the determination of the parallax.

The discussion is therefore limited to observations of double distances.

The observations of single distances and of position-angle are, however, compared with the corresponding tabular quantities, so that the reader may be able readily to derive any conclusions from them, if he should see fit to do so.

The general plan of observation is shown in the accompanying plate.

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CHAPTER I.

COMPARISON OF OBSERVED AND TABULAR QUANTITIES.

The tabular places of *Sappho* referred to in the subsequent discussion have been interpolated from the following ephemeris, which was prepared at the *Berliner Jahrbuch* office and communicated by Dr. Auwers.

The tabular places of the comparison stars were also communicated by Dr. Auwers, and depend upon his discussion of the meridian observations, the details of which will be found in Volume II.

No corrections have been applied to the star places on account of proper motion, as the epoch of the heliometer observations is sufficiently identical with that of the meridian observations.

The general arrangement of the tables, being precisely similar to that of the *Victoria* series, requires no further explanation.

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EPHEMERIS FOR BERLIN, MIDNIGHT.

Date, 1889.	R.A.	Δ_1	Δ_2	Dec.	Δ_1	Δ_2	Log. Δ	Aberration. Time.
	h m s	s	s	° ′ ″	′ ″	″		m s
Sept. 18	1 8 46·073	− 26·199	− 1·601	+ 17 3 1·31	− 7 31·09	− 21·13	9·951373	7 25·1
19	8 18·273	− 27·800	− 1·537	16 55 9·09	− 7 52·22	− 20·79	·949659	23·3
20	7 48·936	− 29·337	− 1·472	46 56·08	− 8 13·01	− 20·49	·948029	21·6
21	7 18·127	− 30·809	− 1·403	38 22·58	− 8 33·50	− 20·13	·946487	20·1
22	6 45·915	− 32·212	− 1·326	29 28·95	− 8 53·63	− 19·69	·945035	18·6
23	6 12·377	− 33·538	− 1·243	20 15·63	− 9 13·32	− 19·17	·943675	17·2
24	5 37·596	− 34·781	− 1·159	10 43·14	− 9 32·49	− 18·67	·942411	16·0
25	5 1·656	− 35·940	− 1·070	0 51·98	− 9 51·16	− 18·09	·941244	14·8
26	4 24·646	− 37·010	− 0·979	15 50 42·73	− 10 9·25	− 17·42	·940177	13·7
27	3 46·657	− 37·989	− 0·887	40 16·06	− 10 26·67	− 16·72	·939212	12·8
28	3 7·781	− 38·876	− 0·788	29 32·67	− 10 43·39	− 15·96	·938351	11·9
29	2 28·117	− 39·664	− 0·690	18 33·32	− 10 59·35	− 15·19	·937596	11·2
30	1 47·763	− 40·354	− 0·591	7 18·78	− 11 14·54	− 14·35	·936948	10·6
Oct. 1	1 6·818	− 40·945	− 0·495	14 55 49·89	− 11 28·89	− 13·47	·936409	10·0
2	0 25·378	− 41·440	− 0·395	44 7·53	− 11 42·36	− 12·59	·935980	9·6
3	0 59 43·543	− 41·835	− 0·299	32 12·58	− 11 54·95	− 11·66	·935661	9·2
4	59 1·409	− 42·134	− 0·203	20 5·97	− 12 6·61	− 10·75	·935454	9·0
5	58 19·072	− 42·337	− 0·110	7 48·61	− 12 17·36	− 9·81	·935359	9·0
6	57 36·625	− 42·447	− 0·015	13 55 21·44	− 12 27·17	− 8·84	·935378	9·0
7	56 54·163	− 42·462	+ 0·081	42 45·43	− 12 36·01	− 7·86	·935510	9·1
8	56 11·782	− 42·381	+ 0·174	30 1·56	− 12 43·87	− 6·86	·935756	9·3
9	55 29·575	− 42·207	+ 0·268	17 10·83	− 12 50·73	− 5·85	·936116	9·7
10	54 47·636	− 41·939	+ 0·360	4 14·25	− 12 56·58	− 4·83	·936590	10·2
11	54 6·057	− 41·579	+ 0·450	12 51 12·84	− 13 1·41	− 3·80	·937178	10·7
12	53 24·928	− 41·129	+ 0·544	38 7·63	− 13 5·21	− 2·75	·937880	11·4
13	52 44·343	− 40·585	+ 0·637	24 59·67	− 13 7·96	− 1·71	·938696	12·2
14	52 4·395	− 39·948	+ 0·723	11 50·00	− 13 9·67	− 0·66	·939625	13·2
15	51 25·170	− 39·225	+ 0·809	11 58 39·67	− 13 10·33	+ 0·41	·940665	14·2
16	50 46·754	− 38·416	+ 0·899	45 29·75	− 13 9·92	+ 1·45	·941817	15·4
17	50 9·237	− 37·517	+ 0·986	32 21·28	− 13 8·47	+ 2·51	·943079	16·6
18	49 32·706	− 36·531	+ 1·066	19 15·32	− 13 5·96	+ 3·55	·944450	18·0
19	48 57·221	− 35·465	+ 1·145	6 12·91	− 13 2·41	+ 4·56	·945929	19·5
20	48 22·921	− 34·320	+ 1·222	10 53 15·06	− 12 57·85	+ 5·59	·947514	21·1
21	47 49·823	− 33·098	+ 1·299	40 22·80	− 12 52·26	+ 6·59	·949203	22·8
22	47 18·024	− 31·799	+ 1·371	27 37·13	− 12 45·67	+ 7·55	·950995	24·7
23	46 47·596	− 30·428	+ 1·439	14 59·01	− 12 38·12	+ 8·46	·952887	26·6
24	46 18·607	− 28·989	+ 1·505	2 29·35	− 12 29·66	+ 9·39	·954878	28·7
25	45 51·123	− 27·484	+ 1·568	9 50 9·08	− 12 20·27	+ 10·31	·956964	30·8
26	45 25·207	− 25·916	+ 1·623	37 59·12	− 12 9·96	+ 11·18	·959144	33·1
27	45 0·914	− 24·293	+ 1·671	26 0·34	− 11 58·78	+ 11·98	·961415	35·5
28	44 38·292	− 22·622	+ 1·719	14 13·54	− 11 46·80	+ 12·69	·963774	37·9
		− 20·903			− 11 34·11			

This ephemeris requires a sensibly constant correction of $+ 0^s{\cdot}12$ and $- 0''{\cdot}5$ to agree with the meridian observations.

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PLACES OF *SAPPHO* COMPARISON STARS FOR EQUINOX 1889·0 AND EPOCH OF OBSERVATION.

Star	Mag.	R.A.	No. of Obs.	Weight.	Epoch.	Dec.	No. of Obs.	Weight.	Epoch.	Annual Proper Motion. R.A.	Annual Proper Motion. Dec.
		h m s				° ′ ″				s	″
A	7·3	0 31 32·040	248	49·4	89·82	10 49 32·02	251	26·2	89·82	0	0
B	7·3	37 4·282	250	50·7	·82	16 3 22·73	254	26·8	·82	— 0·0048	— 0·093
a	7·7	42 25·232	63	23·4	·86	8 36 56·97	63	12·3	·85	0	0
b	9·0	31·036	43	18·7	·80	9 39 11·02	44	9·9	·79	0	— 0·088
c	8·6	44 24·335	51	18·9	·81	11 13 35·33	52	10·4	·83	+ 0·0013	— 0·055
d	8·5	46·695	63	20·5	·83	9 48 24·75	63	11·6	·83	0	0
e	7·0	45 46·167	82	26·0	·84	12 10 52·13	84	14·0	·83	+ 0·0048	0
e′	(*d* 8·3)[1]	46 20·365	37	13·3	·76	9 59 52·39	37	7·1	·77	+ 0·0032	— 0·042
f	7·3	40·053	33	14·0	·81	13 2 43·82	34	7·6	·79	— 0·0008	— 0·028
g	8·3	47 0·659	35	14·3	·82	9 12 5·02	35	7·9	·80	— 0·0014	— 0·045
h	8·4	48 2·927	68	23·4	·84	10 31 12·11	69	12·5	·86	— 0·0021	— 0·062
i	8·2	49 11·963	40	16·9	·79	12 14 44·46	40	8·7	·78	+ 0·0015	— 0·055
k	6·5	50 19·696	46	17·0	·77	13 21 1·76	47	9·7	·77	0	0
l	8·8	40·360	30	12·0	·82	12 6 43·88	30	7·1	·80	0	0
m	8·7	52·288	31	12·4	·89	14 10 29·88	31	7·1	·87	...	...
n	8·7	59·182	46	17·0	·86	9 24 53·76	43	9·1	·84	0	0
o	8·2	51 32·901	48	17·3	·84	11 49 45·88	48	9·9	·83	0	0
p	6·0	52 5·005	82	24·5	·88	13 5 44·19	84	13·2	·88	0	0
q	8·5	53 53·734	40	16·4	·85	14 0 37·95	40	8·5	·85	0	0
r	8·2	55 25·587	41	18·2	·82	10 34 58·92	41	9·1	·80	0	+ 0·026
s	8·0	32·861	58	21·3	·81	11 18 50·81	57	11·2	·80	— 0·0007	+ 0·025
t	(*d* 8·5)[2]	56 43·503	56	20·5	·82	13 39 17·62	56	11·1	·81	0	0
u	8·5	57 9·646	35	15·6	·83	15 32 26·89	35	8·6	·88	— 0·0018	— 0·119
v	7·8	16·353	51	17·4	·91	12 27 10·12	51	9·9	·91	— 0·0032	— 0·046
w	8·7	58 0·531	28	12·9	·78	13 20 26·72	28	7·1	·80	— 0·0032	— 0·019
x	6·0	59 13·758	86	24·9	·82	14 20 56·13	88	14·1	·79	— 0·0009	+ 0·055
y*	9·0	56·987	53	17·4	·82	14 23 15·45	53	10·1	·81	...	...
y	7·7	1 0 4·349	22	10·1	·85	14 47 23·45	22	5·0	·85	— 0·0016	— 0·072
z	8·5	29·583	30	13·4	·81	15 43 9·88	30	7·3	·79	+ 0·0004	— 0·060
α	9·0	1 59·515	67	22·8	·82	15 16 15·04	66	12·4	·82	— 0·0042	— 0·037
β	8·0	2 2·120	35	14·0	·89	16 49 10·64	35	7·8	·90	0	0
γ	8·6	34·855	52	21·1	·87	17 3 40·78	51	10·8	·89	0	— 0·053
δ	6·4	4 18·292	38	14·7	·81	15 4 58·67	38	8·4	·85	0	0
ε	8·8	5 3·794	35	15·2	·83	17 48 6·11	36	8·2	·83	0	0
ζ	8·5	10·193	64	23·2	·85	16 11 12·06	64	12·1	·81	0	0
η	8·2	24·026	57	19·6	·88	14 6 5·05	57	10·7	·90	— 0·0065	— 0·034
θ	8·5	6 55·750	42	17·9	·83	16 10 29·05	43	9·5	·85	0	0
ι	6·0	8 13·821	60	24·1	·82	15 32 44·73	59	12·0	·83	— 0·0034	— 0·008
κ	8·3	10 15·770	67	21·5	·84	17 2 53·24	67	11·8	·82	0	0
λ	8·8	11 34·334	60	24·1	·83	15 46 7·45	60	11·6	·81	0	0
μ	8·0	12 26·032	66	23·4	·80	17 59 31·53	66	11·9	·80	— 0·0031	+ 0·005
C	7·0	17 2·172	226	47·8	·82	10 47 13·28	226	23·1	·81	0	— 0·050
D	7·2	22 25·958	228	47·9	·82	16 30 16·41	227	23·7	·81	+ 0·0051	— 0·023

[1] Dup. Σ67 ; $8^{m}\cdot3$ and $9^{m}\cdot$; $1''\cdot8$, 0° ; Berlin observed mean of the components, not remarked as double in the other series.
[2] Dup. $8^{m}\cdot2$ and $9^{m}\cdot3$; $0''\cdot9$, 175° ; Berlin observed the mean of components, not remarked as double in the other series.

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With these data the tabular and observed quantities have been compared on precisely the same plan as in the case of *Victoria*, except that the tabular Right Ascensions were corrected by $+0^{s}\cdot120$, and the tabular Declinations by $-0''\cdot50$ to agree with the meridian observations, in accordance with a foot-note attached by Prof. Auwers.

The instrumental position-angles given in the original observations have been corrected by the following tables for errors of equatorial adjustment.

Cape.—Position-Angles.

Telescope preceding.		Telescope following.	
Hour Angle.	Correction.	Hour Angle.	Correction.
h	′ ″	h	′ ″
− 4	− 35 43	0	− 36 43
− 3	− 35 43	+ 1	− 36 36
− 2	− 35 41	+ 2	− 36 27
− 1	− 35 37	+ 3	− 36 18
0	− 35 32	+ 4	− 36 8

These corrections have been computed with the same constants as those employed in the reduction of the *Victoria* observations.

Yale.—Position-Angles.

For the Yale observations the same constants have also been employed as in the case of *Victoria*. The resulting corrections are—

Hour Angle.	Telescope East.	Telescope West.
h	′ ″	′ ″
− 4	− 0 39	− 2 3
− 3	− 0 17	− 1 34
− 2	+ 0 7	− 1 5
− 1	+ 0 31	− 0 38
0	+ 0 52	− 0 16
+ 1	+ 1 10	+ 0 1
+ 2	+ 1 23	+ 0 10
+ 3	+ 1 30	+ 0 13
+ 4	+ 1 31	+ 0 8

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Leipzig.—Position-Angles.

From the observations for instrumental constants, printed after the *Sappho*-observations, the following values were found :—

	ξ	η	e
	″	″	″
September 20	+ 86·3	+ 9·6	+ 9·5
November 1	+ 84·8	+ 24·4	+ 7·5
Adopted for *Sappho* obs.	+ 85	+ 17	+ 8

and from the re-discussion of the observations of the *Victoria* standard stars (pp. 448, 449) ψ was adopted $= 110''$ and $\Delta p = 91° - 51''$.

The corrections to the observed position-angles corresponding to these constants are, for the standard stars, and, practically, for all the observations of *Sappho* :—

Hour Angle.	Counterpoise following.	Counterpoise preceding.
h m	° ′ ″	° ′ ″
− 4 0	+ 91 − 3 31	+ 91 − 0 58
− 3 30	− 3 24	− 0 54
− 3 0	− 3 18	− 0 51
− 2 30	− 3 9	− 0 44
− 2 0	− 3 0	− 0 38
− 1 30	− 2 50	− 0 29
− 1 0	− 2 40	− 0 21
− 0 30	− 2 29	− 0 10
0 0	− 2 18	+ 0 1
+ 0 30	− 2 7	+ 0 12
+ 1 0	− 1 55	+ 0 24
+ 1 30	− 1 45	+ 0 36
+ 2 0	− 1 34	+ 0 48
+ 2 30	− 1 25	+ 1 0
+ 3 0	− 1 16	+ 1 11
+ 3 30	− 1 9	+ 1 21
+ 4 0	− 1 2	+ 1 31

Göttingen.—Position-Angles.

For the Göttingen position-angles the same constants for the equatorial adjustments have been adopted as were employed for the final reduction of the *Victoria* observations, viz.—

$$+ 65''\cdot 7 \pm 115'' (- \sin\phi \cos\delta + \cos\phi \sin\delta \cos\tau) - 17'' \sin\tau \sec\delta$$
$$+ 76'' \cos\tau \sec\delta \pm 18'' \sec\delta \mp 1'' \tan\delta$$

(*see* pp. 253 and 451.)

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The corresponding corrections are :—

Axis following.		Axis preceding.	
Hour Angle.	Correction.	Hour Angle.	Correction.
h	′ ″	h	′ ″
− 4	+ 1 0	− 4	+ 3 0
− 3	+ 1 17	− 3	+ 3 10
− 2	+ 1 28	− 2	+ 3 16
− 1	+ 1 33·	− 1	+ 3 18
0	+ 1 32	0	+ 3 16
+ 1	+ 1 24·	+ 1	+ 3 9
+ 2	+ 1 11	+ 2	+ 2 59
+ 3	+ 0 52	+ 3	+ 2 45
+ 4	+ 0 29	+ 4	+ 2 30

Standard Stars.

Position-Angle.

No.	Date.	Observer.	B.M.T.	—	Refraction.	Aber. Sc.	p	Δp	Telescope.
					Cape.		Mean Position-Angle, 239° 18′ 2″		
				° ′ ″	′ ″	′ ″	° ′ ″	″	
83(*a*)	Oct. 4	G	·42008	239 17 36	−0 35	−0 7	239 16 54	+68	W.
89	4	G	·63153	16 3	+1 16	−0 7	17 12	+50	E.
159	25	G	·34049	18 31	−0 38	−0 7	17 46	+16	W.
The observations on October 4 were made by estimation of minutes without microscope reading.									
					Leipzig.				
				° ′ ″	′ ″	′ ″	° ′ ″	″	Counterpoise.
57	Oct. 4	P	·30730	239 16 48	+1 5	−0 7	239 17 46	+16	Preceding.
118	25	P	·27549	17 14	+0 38	−0 7	17 45	+17	Do.
					Göttingen.				
				° ′ ″	′ ″	′ ″	° ′ ″	″	Axis.
25	Oct. 4	S	·45000	239 18 5	−0 6	−0 7	239 17 52	+10	Following.
25(*a*)		S	·46146	18 48	−0 8	−0 7	18 33	−31	Do.

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Standard Stars—*continued.*

Position-Angle.

No.	Date.	Observer.	B.M.T.	—	Refraction.	Aber. Sc.	p	Δp	—
					YALE.				
				° ′ ″	′ ″	′ ″	° ′ ″	″	Tube.
136	Oct. 3	H	·56252	239 17 11	+1 17	−0 7	239 18 21	−19	W.
156	3	E	·89573	18 47	−0 40	−0 7	18 0	+ 2	E.
158	3	E	·90066	18 58	−0 42	−0 7	18 9	− 7	E.
166	Oct. 4	E	·60020	17 42	+0 34	−0 7	18 9	− 7	W.
168	4	E	·60518	17 47	+0 31	−0 7	18 11	− 9	W.
186	4	H	·91411	19 45	−0 54	−0 7	18 44	−42	E.
188	4	H	·92191	19 3	−1 4	−0 7	17 52	+10	E.
229	Oct. 8	E	·56228	17 30	+1 0	−0 7	18 23	−21	W.
231		E	·57156	18 2	+0 49	−0 7	18 44	−42	W.

The corrections Δp have *not* been applied to the observed position-angles which are given in the subsequent table.

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TABLE A.—CAPE DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
I_1	1	μ	Sept. 18	G	·41838	17 12 7·96	+17 3 40·79	+5·89	+6·96	+36·59	+12·50
	2	ζ			·42581	4·96	37·38	+5·59	+7·04	36·48	13·04
	3	ζ			·43240	2·31	34·34	+5·32	+7·10	36·48	13·04
	4	μ			·44596	11 56·84	28·11	+4·73	+7·22	36·60	12·50
			4 pointings	in	each obs.						
I	5	ε		G	·63620	17 10 39·58	+17 2 0·12	−4·92	+7·19	+36·77	+12·83
	6	λ			·64565	35·73	1 55·73	−5·33	+7·10	36·32	12·92
	7	λ			·65303	32·71	52·30	−5·64	+7·03	36·32	12·92
	8	ε			·66413	28·17	47·13	−6·07	+6·92	36·77	12·83
			4 pointings	in	each obs.						
I_3	9	μ	Sept. 19	G	·42167	17 5 11·59	+16 55 48·80	+5·65	+7·04	+36·81	+12·65
	10	ζ			·43160	7·35	44·03	+5·24	+7·14	36·68	13·17
	11	ζ			·43931	4·06	40·32	+4·90	+7·21	36·68	13·18
	12	μ			·44807	0·31	36·10	+4·51	+7·28	36·82	12·65
			4 pointings	in	each obs.						
I_4	13	κ	Sept. 22	G	·40808	16 42 18·29	+16 30 21·08	+5·88	+7·04	+37·31	+13·28
	14	ζ			·41956	12·65	14·86	+5·41	+7·15	37·26	13·58
	15	ζ			·44207	1·57	2·66	+4·40	+7·34	37·26	13·58
	16	κ			·45800	41 53·73	29 54·01	+3·62	+7·45	37·32	13·29
			4 pointings	in	each obs.						
II_1	17	κ	Sept. 23	G	·39740	16 34 2·53	+16 21 15·64	+6·19	+6·98	+37·51	+13·41
	18	α			·40614	33 58·07	10·73	+5·85	+7·06	37·36	13·92
	19	α			·41149	55·33	7·73	+5·62	+7·12	37·36	13·92
	20	κ			·41936	51·31	3·32	+5·29	+7·19	37·51	13·42
			4 pointings	in	each obs.						
II_2	21	ι		G	·63935	16 31 58·44	+16 18 59·35	−5·79	+7·08	+37·35	+13·71
	22	γ			·64698	54·51	55·03	−6·09	+7·00	37·65	13·72
	23	γ			·65306	51·48	51·59	−6·32	+6·94	37·65	13·72
	24	ι			·66224	46·65	46·40	−6·66	+6·84	37·35	13·71
			4 pointings	in	each obs.						
II_3	25	κ	Sept. 24	G	·40189	16 25 20·38	+16 11 42·57	+5·90	+7·06	+37·70	+13·55
	26	α			·40997	16·10	37·88	+5·57	+7·14	37·53	14·04
	27	α			·42112	10·20	31·41	+5·09	+7·24	37·53	14·04
	28	κ			·43347	3·67	24·24	+4·53	+7·34	37·70	13·55
			4 pointings	in	each obs.						

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f	f'	f''
			° ′	″	″	″	″	″			
I_1	1	μ	223 6	4588·094	7·841	4595·935	4596·274	− 0·339	−·683	−·730	−·893
	2	ζ	44 42	4409·509	6·124	4415·633	4415·910	− 0·277	+·703	+·711	+·877
	3	ζ	44 42	4405·341	5·513	4410·854	4411·828	− 0·974	+·703	+·711	+·863
	4	μ	223 6	4608·681	5·250	4613·931	4613·369	+ 0·562	−·683	−·730	−·836
I_2	5	ε	131 52	4146·866	4·826	4151·692	4152·618	− 0·926	+·745	−·667	−·830
	6	λ	331 2	5185·641	6·518	5192·159	5191·828	+ 0·331	−·484	+·875	+·868
	7	λ	330 59	5182·754	7·171	5189·925	5190·319	− 0·394	−·485	+·874	+·876
	8	ε	132 7	4144·498	7·551	4152·049	4152·607	− 0·558	+·742	−·671	−·895
I_3	9	μ	222 45	5205·335	8·004	5213·339	5213·492	− 0·153	−·679	−·734	−·884
	10	ζ	45 26	3793·041	4·548	3797·589	3798·557	− 0·968	+·712	+·702	+·858
	11	ζ	45 26	3788·800	4·106	3792·906	3793·523	− 0·617	+·712	+·702	+·840
	12	μ	222 45	5224·946	5·562	5230·508	5230·713	− 0·205	−·679	−·734	−·827
I_4	13	κ	236 50	3573·853	5·277	3579·130	3579·643	− 0·513	−·837	−·547	−·857
	14	ζ	50 43	1791·827	2·193	1794·020	1794·895	− 0·875	+·774	+·634	+·855
	15	ζ	50 47	1776·562	1·615	1778·177	1778·323	− 0·146	+·775	+·632	+·791
	16	κ	236 42	3612·488	2·692	3615·180	3615·794	− 0·614	−·836	−·549	−·699
II_1	17	κ	234 12	4273·345	7·484	4280·829	4281·029	− 0·200	−·811	−·585	−·890
	18	α	43 20	5338·735	7·667	5346·402	5346·735	− 0·333	+·686	+·727	+·898
	19	α	43 20	5335·166	7·068	5342·234	5342·636	− 0·402	+·686	+·727	+·888
	20	κ	234 10	4292·038	5·175	4297·213	4297·562	− 0·349	−·811	−·585	−·833
II_2	21	ι	326 8	3329·120	4·813	3333·933	3333·628	+ 0·305	−·557	+·830	+·897
	22	γ	131 46	4035·572	7·000	4042·572	4042·437	+ 0·135	+·746	−·666	−·902
	23	γ	131 50	4034·561	7·845	4042·406	4042·448	− 0·042	+·745	−·667	−·915
	24	ι	325 50	3322·550	7·054	3329·604	3329·517	+ 0·087	−·562	+·827	+·925
II_3	25	κ	232 15	5018·504	7·724	5026·228	5026·515	− 0·287	−·791	−·612	−·880
	26	α	43 42	4579·666	5·904	4885·570	4586·045	− 0·475	+·691	+·723	+·886
	27	α	43 42	4572·201	5·095	4577·296	4577·205	+ 0·091	+·691	+·723	+·861
	28	κ	232 13	5045·915	4·875	5050·790	5051·304	− 0·514	−·790	−·613	−·794

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
II₄	29	κ	Sept. 25	G	·39879	16 16 24·71	+16 1 55·15	+5·91	+7·07	+37·87	+13·68
	30	α			·40981	18·69	48·56	+5·45	+7·18	37·70	14·16
	31	α			·41980	13·24	42·57	+5·02	+7·26	37·70	14·16
	32	κ			·42911	8·15	37·00	+4·59	+7·34	37·88	13·68
			4 pointings	in	each obs.						
II₅	33	*	Sept. 26	G	·61317	16 14 27·36	+15 59 46·46	−4·95	+7·28		
	34	ι			·62539	20·65	39·10	−5·49	+7·17	37·71	13·95
	35	ι			·63378	16·05	34·05	−5·84	+7·09	37·71	13·95
	36	*			·64578	9·45	26·81	−6·31	+6·97		
II₆	37	θ	Sept. 26	G	·40525	16 7 7·56	+15 51 43·81	+5·52	+7·16	+37·95	+14·02
	38	α			·40982	5·00	40·99	+5·33	+7·21	37·87	14·28
	39	α			·41522	1·97	37·67	+5·09	+7·25	37·87	14·28
	40	θ			·42204	6 58·14	33·46	+4·78	+7·31	37·96	14·03
			4 pointings	in	each obs.						
II₇	41	γ		G	·61138	16 5 11·55	+15 49 36·39	−5·02	+7·27	+38·16	+14·11
	42	η			·61768	7·99	32·47	−5·30	+7·21	37·71	14·32
	43	η			·62293	5·04	29·23	−5·53	+7·16	37·71	14·32
	44	γ			·63033	0·86	24·64	−5·84	+7·10	38·16	14·11
			4 pointings	in	each obs.						
II₈	45	α	Sept. 27	G	·38940	15 57 48·23	+15 41 28·87	+6·05	+7·05	+38·02	+14·40
	46	ζ			·39622	44·30	24·55	+5·78	+7·11	38·13	14·20
	47	ζ			·40323	40·27	20·12	+5·48	+7·18	38·13	14·20
	48	α			·41242	34·98	14·30	+5·08	+7·26	38·02	14·40
			4 pointings	in	each obs.						
†	49	γ	Sept. 27	F	·59117	15 55 51·94	+15 39 20·78	−4·23	+7·40	+38·31	+14·23
III₁	50	ε	Sept. 28	G	·62565	15 45 47·33	+15 28 13·45	−5·92	+7·08	+38·27	+14·55
	51	δ			·63606	41·17	6·65	−6·33	+6·98	38·17	14·48
	52	δ			·64461	36·12	1·06	−6·64	+6·89	38·17	14·48
	53	ε			·65632	29·20	27 53·40	−7·04	+6·76	38·27	14·55
			4 pointings	in	each obs.						

* In set II₅ a wrong comparison star appears to have been observed in lieu of β.
Clouded up after the first two pointings with η, observations therefore useless.

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f	f'	f''
			° ′	″	″	″	″	″			
II_4	29	κ	230 47	5786·926	8·838	5795·764	5795·576	+ 0·188	—·775	—·632	—·887
	30	α	44 12	3797·900	4·585	3802·485	3803·264	— 0·779	+·697	+·717	+·880
	31	α	44 12	3790·370	4·014	3794·384	3795·085	— 0·701	+·697	+·717	+·857
	32	κ	230 45	5814·109	5·652	5819·761	5820·209	— 0·448	—·774	—·633	—·806
II_5	33										
	34	ι	299 12	3292·136	3·531	3295·667	3295·912	— 0·245	—·873	+·488	+·811
	35	ι	299 4	3293·556	4·038	3297·594	3297·584	+ 0·010	—·874	+·486	+·836
	36										
II_6	37	θ	242 17	2430·665	2·684	2433·349	2433·445	— 0·096	—·885	—·465	—·803
	38	α	45 0	2993·191	3·419	2996·610	2996·643	— 0·033	+·707	+·707	+·873
	39	α	45 0	2988·590	3·184	2991·774	2992·101	— 0·327	+·707	+·707	+·859
	40	θ	242 10	2444·634	2·115	2446·749	2446·867	— 0·118	—·884	—·467	—·748
II_7	41	γ	161 35	4685·895	5·129	4691·024	4691·543	— 0·519	+·316	—·949	—·843
	42	η	351 11	6267·804	6·083	6273·887	6274·441	— 0·554	—·153	+·988	+·790
	43	η	351 9	6265·098	6·368	6271·466	6271·656	— 0·190	—·154	+·988	+·789
	44	γ	161 45	4692·893	6·328	4699·221	4699·391	— 0·170	+·313	—·950	—·851
II_8	45	α	46 26	2182·346	3·145	2185·491	2185·901	— 0·410	+·724	+·689	+·908
	46	ζ	213 12	2141·395	2·916	2144·311	2144·492	— 0·181	—·548	—·837	—·900
	47	ζ	213 13	2147·630	2·661	2150·291	2150·422	— 0·131	—·548	—·837	—·890
	48	α	46 28	2163·096	2·227	2165·323	2166·079	— 0·756	+·725	+·689	+·855
	49	γ	169 25	5149·780	4·530	5154·310	5154·495	— 0·185	+·184	—·983	—·802
III_1	50	ε	112·33	2353·800	2·765	2356·565	2356·446	+ 0·119	+·924	—·384	—·799
	51	δ	320 33	1785·107	2·931	1788·038	1787·849	+ 0·189	—·635	+·772	+·926
	52	δ	320 18	1782·643	3·430	1786·073	1786·770	— 0·697	—·639	+·769	+·939
	53	ε	113 11	2341·372	5·388	2346·760	2347·295	— 0·535	+·920	—·394	—·890

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
III₂	54	ζ	Sept. 29	G	·38320	15 38 16·60	+15 19 53·96	+6·06	+7·05	+38·44	+14·44
	55	x			·39163	11·54	48·34	+5·71	+7·13	38·20	14·78
	56	x			·39809	7·67	44·05	+5·44	+7·19	38·20	14·79
	57	ζ			·40627	2·78	38·60	+5·08	+7·25	38·45	14·44
			8 pointings	in	each obs.						
III₃	58	x	Sept. 30	G	·38748	15 28 9·85	+15 8 38·30	+5·76	+7·11	+38·34	+14·89
	59	ζ			·40078	1·75	29·25	+5·19	+7·23	38·59	14·56
	60	ζ			·40869	27 56·94	23·87	+4·83	+7·29	38·59	14·56
	61	x			·41935	50·44	16·62	+4·33	+7·37	38·34	14·89
			8 pointings	in	each obs.						
†	62	u		G	·61724	15 25 49·72	15 6 1·65	—5·84	+7·09	+38·53	+14·90
III₄	63	α	Oct. 1	G	·37362	15 18 5·20	+14 57 20·66	+6·19	+7·01	+38·59	+14·84
	64	y*			·38880	17 55·84	10·12	+5·57	+7·15	38·47	14·97
	65	y*			·39634	51·18	4·89	+5·24	+7·21	38·48	14·97
	66	α			·40583	45·32	56 58·30	+4·81	+7·29	38·60	14·85
	67	α			·41405	40·25	52·60	+4·43	+7·35	38·60	14·85
	68	y*			·42384	34·21	45·80	+3·95	+7·41	38·48	14·97
			8 pointings	in	each obs.						
III₅	69	u		G	·60066	15 15 44·88	+14 54 42·75	—5·27	+7·20	+38·66	+15·01
	70	η			·61381	36·74	33·59	—5·83	+7·09	38·47	14·84
			8 pointings	in	each obs.						
III₆	71	u	Oct. 2	G	·58683	15 5 31·31	+14 43 8·97	—4·79	+7·28	+38·78	+15·12
	72	η			·60052	22·74	42 59·25	—5·41	+7·17	38·60	14·94
	73	η			·60986	16·89	52·62	—5·81	+7·09	38·60	14·94
	74	u			·62222	9·16	43·84	—6·30	+6·97	38·78	15·12
			8 pointings	in	each obs.						
IV₁	75	x	Oct. 3	G	·39766	14 57 2·52	+14 33 29·37	+4·90	+7·25	+38·72	+15·19
	76	x			·40872	56 55·56	21·40	+4·38	+7·33	38·72	15·20
			8 pointings	in	each obs.						
IV₂	82	x	Oct. 4	G	·40308	14 46 27·50	+14 21 20·00	+4·49	+7·29	+38·84	+15·29
	83	x			·41190	21·92	13·56	+4·06	+7·35	38·84	15·29
			8 pointings	in	each obs.						

† Clouded up before the opposite star could be observed.

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
III_2	54	ζ	216 41	3841·776	5·971	3847·747	3847·712	+ 0·035	—·597	—·802	—·914
	55	x	39 0	4529·229	5·729	4534·958	4535·252	— 0·294	+·629	+·777	+·900
	56	x	39 0	4523·800	5·242	4529·042	4529·443	— 0·401	+·629	+·777	+·889
	57	ζ	216 43	3864·167	4·356	3868·523	3868·393	+ 0·130	—·598	—·802	—·875
III_3	58	x	38 32	3644·407	4·724	3649·131	3649·101	+ 0·030	+·623	+·782	+·902
	59	ζ	217 30	4746·581	5·551	4752·132	4752·121	+ 0·011	—·609	—·793	—·878
	60	ζ	217 31	4754·040	5·057	4759·097	4759·379	— 0·282	—·609	—·793	—·862
	61	x	38 30	3616·183	3·214	3619·397	3619·811	— 0·414	+·623	+·783	+·837
	62	u	112 8	4222·873	4·838	4227·711	4227·891	— 0·180	+·926	—·377	—·790
III_4	63	α	212 1	1344·798	2·084	1346·882	1347·184	— 0·302	—·530	—·848	—·911
	64	y*	27 27	2281·180	2·720	2283·900	2283·893	+ 0·007	+·461	+·887	+·882
	65	y*	27 24	2274·496	2·489	2276·985	2277·082	— 0·097	+·460	+·888	+·873
	66	α	212 16	1375·163	1·411	1376·574	1376·813	— 0·239	—·534	—·846	—·865
	67	α	212 19	1382·768	1·307	1384·075	1384·393	— 0·318	—·535	—·845	—·850
	68	y*	27 13	2250·338	1·912	2252·250	2252·199	+ 0·051	+·458	+·889	+·834
III_5	69	u	124 16	4030·401	4·275	4034·676	4035·223	— 0·547	+·826	—·563	—·826
	70	η	307 3	4807·372	5·889	4813·261	4813·600	— 0·339	—·798	+·603	+·877
III_6	71	u	137 13	4036·090	4·059	4040·149	4040·745	— 0·596	+·679	—·734	—·849
	72	η	296 26	4950·764	4·656	4955·420	4955·733	— 0·313	—·895	+·445	+·787
	73	η	296 20	4952·053	5·377	4957·430	4958·189	— 0·759	—·896	+·444	+·818
	74	u	137 42	4036·699	6·773	4043·472	4044·081	— 0·609	+·673	—·739	—·925
IV_1	75	x	32 4	878·539	0·880	879·419	879·554	— 0·135	+·531	+·847	+·866
	76	x	31 57	868·508	0·779	869·287	869·017	+ 0·270	+·529	+·849	+·847
IV_2	82	x	276 6	149·047	0·058	149·105	149·282	— 0·177	—·994	+·106	—·356
	83	x	273 31	154·226	0·058	154·284	154·551	— 0·267	—·998	+·061	—·348

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
IV_3	88	x_1'		G	·62122	14 44 9·24	+14 18 40·28	−6·50	+6·90	+38·86	+15·31
			8 pointings.								
IV_4	90	x	Oct. 5	G	·36165	14 36 19·04	+14 9 34·40	+6·15	+6·97	+38·95	+15·38
	91	t			·37222	12·31	26·56	+5·72	+7·07	38·84	15·49
	92	t			·38092	6·78	20·12	+5·04	+7·19	38·84	15·49
	93	x			·39304	35 59·06	11·14	+4·81	+7·23	38·95	15·39
			8 pointings	in	each obs.						
IV_5	94	x	Oct. 6	G	·37008	14 25 37·10	+13 57 2·26	+5·67	+7·06	+39·06	+15·48
	95	t			·38482	27·71	56 51·20	+5·03	+7·17	38·94	15·58
	96	t			·39471	21·42	43·78	+4·57	+7·24	38·94	15·58
	97	x			·40464	15·08	36·31	+4·10	+7·31	39·06	15·48
			8 pointings	in	each obs.						
IV_6	98	t	Oct. 7	G	·36571	14 15 2·89	+13 44 30·69	+5·76	+7·03	+39·04	+15·67
	99	t			·37970	14 53·98	20·07	+5·11	+7·14	39·04	15·67
			8 pointings	in	each obs.						
V_1	100	x	Oct. 10	G	·34910	13 43 34·07	+13 6 15·13	+5·97	+6·90	+39·44	+15·83
	101	l			·35785	28·58	8·33	+5·61	+6·97	39·02	16·09
	102	l			·36514	24·00	2·66	+5·30	+7·03	39·02	16·09
	103	x			·37418	18·34	5 55·62	+4 90	+7·09	39·44	15·83
			8 pointings	in	each obs.						
V_2	104	m	Oct. 10	G	·55150	13 41 27·18	+13 3 37·50	−4·31	+7·17	+39·29	+16·11
	105	v			·56148	20·93	29·72	−4·77	+7·10	39·18	15·92
	106	v			·56927	16·05	23·65	−5·12	+7·05	39·18	15·92
	107	m			·58004	9·30	15·24	−5·59	+6·97	39·29	16·11
			8 pointings	in	each obs.						
V_3	108	w	Oct. 12	G	·35029	13 22 50·66	+12 40 8·82	+5·63	+6·90	+39·44	+16·03
	109	i			·35919	45·19	1·82	+5·25	+6·97	39·13	16·27
	110	i			·36493	41·66	39 57·30	+5·00	+7·01	39·13	16·27
	111	w			·37337	36·48	50·67	+4·62	+7·06	39·44	16·03
			8 pointings	in	each obs.						

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
IV_3	88	x	243 48	326·207	0·126	326·333	326·655	— 0·322	—·897	—·442	+·260
IV_4	90	x	226 52	1007·644	1·448	1009·092	1009·479	— 0·387	—·730	—·684	—·912
	91	t	38 43	2304·570	2·766	2307·336	2307·436	— 0·100	+·625	+·780	+·898
	92	t	38 42	2296·449	2·461	2298·910	2298·741	+ 0·169	+·625	+·780	+·866
	93	x	226 43	1039·431	0·956	1040·387	1004·300	+ 0·087	—·728	—·686	—·836
IV_5	94	x	223 19	1980·110	2·383	1982·493	1982·429	+ 0·064	—·686	—·728	—·891
	95	t	38 1	1325·245	1·287	1326·532	1326·570	— 0·038	+·616	+·788	+·866
	96	t	37 59	1315·445	1·153	1316·598	1316·746	— 0·148	+·616	+·788	+·844
	97	x	223 18	2014·948	1·606	2016·554	2016·834	— 0·280	—·686	—·728	—·805
IV_6	98	t	34 42	369·796	0·444	370·240	370·315	— 0·075	+·570	+·822	+·897
	99	t	34 27	355·971	0·361	356·332	356·418	— 0·086	+·566	+·825	+·870
V_1	100	x	220 21	5882·056	8·121	5890·177	5890·863	— 0·686	—·647	—·762	—·903
	101	l	45 59	5110·271	5·577	5115·848	5116·031	— 0·183	+·719	+·695	+·877
	102	l	45 59	5103·460	5·061	5108·521	5108·708	— 0·187	+·719	+·695	+·800
	103	x	220 21	5909·521	5·840	5915·361	5916·182	— 0·821	—·647	—·762	—·849
V_2	104	m	140 6	5236·223	4·557	5240·780	5241·510	— 0·730	+·642	—·767	—·820
	105	v	313 57	3124·344	2·765	3127·109	3127·412	— 0·303	—·720	+·694	+·827
	106	v	313 49	3123·921	3·028	3126·949	3126·850	+ 0·099	—·722	+·692	+·848
	107	m	140 25	5240·147	6·365	5246·512	5246·900	— 0·388	+·637	—·771	—·884
V_3	108	w	238 32	4644·908	5·101	4650·009	4650·219	— 0·210	—·853	—·522	—·829
	109	i	68 9	4048·712	3·256	4051·968	4050·200	— 0·232	+·928	+·372	+·735
	110	i	68 11	4044·054	3·008	4047·062	4047·118	— 0·056	+·928	+·372	+·714
	111	w	238 27	4668·073	3·739	4671·812	4672·273	— 0·461	—·852	—·523	—·754

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
V_4	112	m	Oct. 12	G	·54800	13 20 49·36	+12 37 33·30	−4·42	+7·08	+39·42	+16·27
	113	s			·56348	39·88	21·11	−5·12	+6·98	39·17	16·09
	114	s			·57438	33·19	12·53	−5·59	+6·91	39·17	16·09
	115	m			·58758	25·11	2·14	−6·12	+6·80	39·42	16·27
			8 pointings	in	each obs.						
V_5	116	k	Oct. 13	G	·55195	13 10 38·59	+12 24 22·13	−4·74	+7·00	+39·36	+16·34
	117	s			·56142	32·87	14·65	−5·16	+6·94	39·24	16·15
	118	s			·57012	27·62	7·79	−5·53	+6·88	39·24	16·15
	119	k			·58083	21·15	23 59·34	−5·96	+6·80	39·36	16·35
			8 pointings	in	each obs.						
VI_1	120	t	Oct. 14	G	·36629	13 2 30·22	+12 13 39·10	+4·63	+6·99	+39·60	+16·21
	121	h			·37734	23·63	30·37	+4·11	+7·05	39·03	16·36
	122	h			·38665	18·09	23·01	+3·66	+7·10	39·03	16·37
	123	t			·39862	10·97	13·56	+3·06	+7·15	39·60	16·22
			8 pointings	in	each obs.						
VI_2	124	f	Oct. 14	G	·54137	13 0 46·13	+12 11 20·78	−4·39	+7·01	+39·29	+16·51
	125	s			·54952	41·29	14·32	−4·76	+6·96	39·30	16·20
	126	s			·55497	38·06	10·02	−5·00	+6·93	39·30	16·20
	127	f			·56310	33·24	3·60	−5·35	+6·87	39·29	16·51
			8 pointings	in	each obs.						
VI_3	128	f	Oct. 15	G	·53999	12 50 58·98	+11 58 11·53	−4·45	+6·96	+39·33	+16·57
	129	s			·54884	53·83	4·54	−4·86	+6·91	39·35	16·26
	130	s			·55425	50·68	0·26	−5·09	+6·88	39·35	16·26
	131	f			·57171	40·52	57 46·47	−5·82	+6·75	39·33	16·57
			8 pointings	in	each obs.						
VI_4	132	o	Oct. 18	G	·33660	12 24 43·62	+11 21 27·01	+5·30	+6·72	+39·43	+16·54
	133	h			·34785	37·52	18·19	+4·82	+6·79	39·19	16·55
	134	h			·35583	33·18	11·91	+4·46	+6·84	39·19	16·55
	135	o			·36424	28·61	5·31	+4·07	+6·88	39·43	16·54
			8 pointings	in	each obs.						
VI_5	136	e	Oct. 18	G	·52294	12 23 2·74	+11 19 0·80	−4·06	+6·87	+39·30	+16·73
	137	r			·53226	22 57·71	18 53·49	−4·48	+6·82	39·41	16·38
	138	r			·53861	54·28	48·51	−4·77	+6·79	39·41	16·38
	139	e			·54786	49·29	41·26	−5·17	+6·73	39·31	16·73
	140	e			·55908	43·23	32·46	−5·63	+6·66	39·31	16·73
	141	r			·56913	37·82	24·59	−6·02	+6·59	39·41	16·38
			8 pointings	in	each obs.						

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
V_4	112	m	158 51	5983·360	5·284	5988·644	5989·082	− 0·438	+·361	−·933	−·817
	113	s	337 26	5085·590	4·796	5090·386	5091·036	− 0·650	−·384	+·923	+·836
	114	s	337 19	5080·378	5·339	5085·717	5085·751	− 0·034	−·386	+·923	+·849
	115	m	159 11	6000·592	8·005	6008·597	6009·413	− 0·816	+·355	−·935	−·848
V_5	116	k	149 2	3972·287	3·669	3975·956	3975·927	+ 0·029	+·515	−·857	−·838
	117	s	326 56	4666·442	4·472	4670·914	4671·252	− 0·338	−·546	+·838	+·857
	118	s	326 50	4663·318	4·941	4668·259	4668·466	− 0·207	−·547	+·837	+·872
	119	k	149 25	3981·042	5·170	3986·212	3986·394	− 0·182	+·509	−·861	−·882
VI_1	120	t	218 4	6532·615	5·839	6538·454	6538·842	− 0·388	−·617	−·787	−·829
	121	h	30 23	7098·771	5·275	7104·046	7104·310	− 0·264	+·506	+·863	+·812
	122	h	30 22	7089·470	4·907	7094·377	7095·030	− 0·653	+·506	+·863	+·794
	123	t	218 5	6566·430	4·385	6570·815	6571·379	− 0·564	−·617	−·787	−·748
VI_2	124	f	123 25	5609·034	4·167	5613·201	5614·140	− 0·939	+·835	−·551	−·744
	125	s	315 3	4424·547	3·678	4428·225	4428·546	− 0·321	−·707	+·708	+·822
	126	s	314 59	4424·091	3·914	4428·005	4427·889	+ 0·116	−·707	+·707	+·835
	127	f	123 39	5606·564	5·541	5612·105	5612·479	− 0·374	+·833	−·554	−·816
VI_3	128	f	133 20	5651·305	4·553	5655·858	5656·522	− 0·664	+·727	−·685	−·794
	129	s	302 19	4381·204	3·349	4384·553	4384·772	− 0·219	−·845	+·535	+·772
	130	s	302 15	4381·434	3·584	4385·018	4385·274	− 0·256	−·846	+·534	+·789
	131	f	133 39	5652·202	6·984	5659·186	5659·912	− 0·726	+·723	−·690	−·878
VI_4	132	o	225 0	2413·577	2·434	2416·011	2416·264	− 0·253	−·707	−·707	−·842
	133	h	24 38	3293·324	2·788	3296·112	3296·252	− 0·140	+·417	+·909	+·814
	134	h	24 36	3286·137	2·600	3288·737	3288·667	+ 0·070	+·417	+·909	+·804
	135	o	224 54	2440·841	1·806	2442·647	2442·761	− 0·114	−·706	−·708	−·769
VI_5	136	e	133 36	4521·734	3·337	4525·071	4525·311	− 0·240	+·724	−·690	−·762
	137	r	296 33	5867·887	3·846	5871·733	5871·919	− 0·186	−·895	+·447	+·698
	138	r	296 30	5868·414	4·148	5872·562	5872·962	− 0·400	−·895	+·446	+·722
	139	e	133 55	4523·986	4·449	4528·435	4528·652	− 0·217	+·720	−·694	−·832
	140	e	134 3	4524·583	5·193	4529·776	4530·225	− 0·449	+·718	−·696	−·860
	141	r	296 12	5871·530	6·404	5877·934	5877·892	+ 0·042	−·897	+·442	+·821

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
VII$_1$	142	o	Oct. 19	G	·33274	12 15 50·91	+11 8 26·95	+5·30	+6·68	+39·47	+16·59
	143	d			·34177	46·15	19·90	+4·92	+6·73	39·04	16·62
	144	d			·34912	42·29	14·16	+4·60	+6·77	39·04	16·62
	145	o			·35630	38·51	8·55	+4·27	+6·81	39·47	16·59
			8 pointings	in	each obs.						
VII$_2$	146	c	Oct. 21	G	·52739	11 57 18·31	+10 40 5·18	−4·63	+6·66	+39·21	+16·84
	147	n			·53945	12·45	39 55·91	−5·14	+6·59	39·25	16·52
	148	n			·54641	9·07	50·56	−5·43	+6·55	39·25	16·52
	149	c			·55529	4·75	43·73	−5·77	+6·49	39·21	16·84
			8 pointings	in	each obs.						
VII$_3$	150	h	Oct. 23	F	·34045	11 43 9·45	+10 17 2·82	+4·35	+6·60	+39·29	+16·75
	151	d			·37189	42 55·33	16 39·09	+2·88	+6·72	39·09	16·76
			8 pointings	in	each obs.						
VII$_4$	152	c	Oct. 24	G	·52731	11 34 31·55	+10 2 12·38	−4·94	+6·47	+39·22	+16·95
	153	g			·53920	26·52	3·52	−5·42	+6·40	39·12	16·67
	154	g			·54556	23·83	1 58·78	−5·67	+6·36	39·12	16·67
	155	c			·55569	19·54	51·24	−6·04	+6·29	39·22	16·95
			8 pointings	in	each obs.						
VII$_5$	157	d	Oct. 25	G	·32135	11 29 2·71	+ 9 52 23·95	+4·86	+6·43	+39·09	+16·81
	158	d			·32752	0·21	19·40	+4·60	+6·47	39·09	16·81
			8 pointings	in	each obs.						
VII$_6$	163	h	Oct. 27	G	·32401	11 16 19·73	+ 9 28 9·26	+4·44	+6·37	+39·29	+16·87
	164	a			·33247	16·72	3·21	+4·08	+6·41	38·86	16·76
	165	a			·33913	14·35	27 58·45	+3·78	+6·43	38·86	16·76
	166	h			·34859	10·98	51·69	+3·34	+6·47	39·29	16·87
			8 pointings	in	each obs.						

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
VII$_1$	142	o	221 53	3339·226	3·388	3342·614	3342·502	+ 0·112	—·668	—·745	—·845
	143	d	38 4	6073·145	5·205	6078·350	6078·320	+ 0·030	+·617	+·787	+·828
	144	d	38 4	6066·461	4·825	6071·286	6071·307	— 0·021	+·617	+·787	+·811
	145	o	221 50	3362·283	2·626	3364·909	3364·903	+ 0·006	—·667	—·745	—·787
VII$_2$	146	c	124 11	3592·019	2·808	3594·827	3595·559	— 0·732	+·827	—·562	—·750
	147	n	327 34	5317·858	4·857	5322·715	5322·788	— 0·073	—·536	+·844	+·827
	148	n	327 30	5314·626	5·247	5319·873	5320·184	— 0·311	—·537	+·843	+·839
	149	c	124 36	3590·590	4·139	3594·729	3595·887	— 1·158	+·823	—·568	—·836
VII$_3$	150	h	231 16	1372·074	0·994	1373·068	1373·570	— 0·502	—·780	—·626	—·747
	151	d	47 4	2472·278	1·361	2473·639	2472·805	+ 0·834	+·732	+·681	+·665
VII$_4$	152	c	159 10	4589·949	3·985	4593·934	4593·774	+ 0·160	+·355	—·935	—·777
	153	g	347 13	3061·543	2·607	3064·150	3064·232	— 0·082	—·221	+·975	+·742
	154	g	347 8	3057·295	2·772	3060·067	3060·216	— 0·149	—·223	+·975	+·745
	155	c	159 25	4603·207	5·490	4608·697	4609·166	— 0·469	+·351	—·937	—·798
VII$_5$	157	d	77 2	1018·638	0·622	1019·260	1019·228	+ 0·032	+·974	+·224	+·610
	158	d	77 14	1015·050	0·572	1015·622	1015·574	+ 0·048	+·975	+·221	+·585
VII$_6$	163	h	215 1	4628·247	3·690	4631·937	4631·898	+ 0·039	—·574	—·819	—·773
	164	a	37 22	3842·536	2·681	3845·217	3845·288	— 0·071	+·607	+·795	+·754
	165	a	37 23	3837·313	2·531	3839·844	3839·925	— 0·081	+·607	+·795	+·737
	166	h	215 0	4648·928	3·012	4651·940	4651·784	+ 0·156	—·574	—·819	—·719

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TABLE B.—YALE DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	1	ε	Sept. 19	H	·60550	17 3 52·76	+16 54 20·03	+7·11	−5·34	+36·97	+12·97
	2	λ			·61377	49·20	16·02	+6·94	−5·24	36·53	13·04
	3	λ			·61944	46·75	13·27	+6·81	−5·17	36·53	13·05
	4	ε			·62577	44·02	10·20	+6·66	−5·10	36·97	12·97
	5	ε			·63428	40·35	6·07	+6·43	−5·00	36·97	12·97
I_5	6	λ			·67299	23·62	53 47·27	+5·19	−4·60	36·54	13·05
	7	λ			·67793	21·49	44·87	+5·01	−4·56	36·54	13·05
	8	ε			·68980	16·35	39·10	+4·55	−4·46	36·98	12·98
	9	ε			·69535	13·94	36·39	+4·33	−4·42	36·98	12·98
	10	λ			·70691	8·94	30·76	+3·85	−4·34	36·55	13·06
	11	γ	Sept. 21	H	·62155	16 48 38·51	+16 37 20·94	+6·65	−5·14	+37·29	+13·45
	12	λ			·63195	33·56	15·47	+6·36	−5·02	36·95	13·31
	13	λ			·63695	31·18	12·84	+6·22	−4·88	36·95	13·31
	14	γ			·64447	27·61	8·89	+5·99	−4·89	37·29	13·45
	15	γ			·64908	25·41	6·46	+5·84	−4·84	37·29	13·45
	16	λ			·65628	21·98	2·67	+5·60	−4·77	36·96	13·32
I_6	17	λ			·66217	19·18	36 59·57	+5·39	−4·72	36·96	13·32
	18	γ			·68041	10·50	49·96	+4·70	−4·56	37·30	13·46
	19	γ			·69140	5·26	44·16	+4·26	−4·47	37·30	13·46
	20	λ			·69649	2·83	41·48	+4·05	−4·44	36·96	13·32
	21	λ			·70139	0·49	38·89	+3·84	−4·40	36·96	13·32
	22	γ			·70627	47 58·17	36·32	+3·63	−4·37	37·30	13·46
	23	γ	Sept. 22	E	·58720	16 40 49·94	+16 28 43·74	+7·34	−5·55	+37·46	+13·58
	24	λ			·59097	48·07	41·69	+7·27	−5·50	37·13	13·43
	25	λ			·59520	45·98	39·38	+7·19	−5·45	37·13	13·43
	26	γ			·59871	44·24	37·47	+7·12	−5·40	37·46	13·58
	27	γ			·60196	42·63	35·70	+7·06	−5·36	37·46	13·58
	28	λ			·60613	40·57	33·43	+6·96	−5·31	37·13	13·43
I_7	29	λ			·60959	38·85	31·54	+6·88	−5·27	37·13	13·43
	30	γ			·61278	37·27	29·80	+6·81	−5·23	37·46	13·58
	31	γ			·61597	35·69	28·05	+6·73	−5·20	37·46	13·58
	32	λ			·61976	33·81	25·98	+6·63	−5·15	37·14	13·44
	33	λ			·62279	32·31	24·33	+6·55	−5·12	37·14	13·44
	34	γ			·62618	30·62	22·48	+6·46	−5·08	37·46	13·58
	35	x	Sept. 22	H	·93308	16 37 57·60	+16 25 34·00	−6·46	−5·09	+37·41	+13·35
I_8	36	ζ			·94097	53·65	29·65	−6·67	−5·18	37·36	13·65
	37	ζ			·94671	50·77	26·48	−6·81	−5·24	37·36	13·65

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
I_5	1	ε	140 4	333·443	0·372	4232·47	4231·41	+ 1·06	+·642	—·767	+·847
	2	λ	324 35	393·539	·403	4994·84	4994·00	+ 0·84	—·580	+·815	—·812
	3	λ	324 33	393·519	·371	4994·17	4993·25	+ 0·92	—·580	+·815	—·799
	4	ε	140 14	333·642	·276	4233·78	4233·17	+ 0·61	+·640	—·769	+·800
	5	ε	140 19	333·718	·249	4234·40	4233·89	+ 0·51	+·639	—·769	+·778
	6	λ	324 9	393·205	·208	4988·12	4986·46	+ 1·66	—·586	+·811	—·664
	7	λ	324 7	393·104	·200	4986·74	4985·85	+ 0·89	—·586	+·810	—·650
	8	ε	140 48	334·201	·153	4239·31	4238·64	+ 0·67	+·632	—·775	+·621
	9	ε	140 51	334·189	·147	4239·08	4239·12	— 0·04	+·631	—·775	+·604
	10	λ	323 54	392·780	·167	4982·21	4982·36	— 0·15	—·589	+·808	—·568
I_6	11	γ	112 13	338·520	0·220	4294·92	4294·94	— 0·02	+·928	—·372	+·782
	12	λ	308 35	382·536	·230	4853·13	4853·86	— 0·73	—·778	+·628	—·789
	13	λ	308 32	382·580	·214	4853·48	4854·19	— 0·71	—·778	+·628	—·769
	14	γ	112 25	338·032	·164	4288·02	4289·12	— 1·10	+·927	—·375	+·715
	15	γ	112 28	338·005	·135	4287·31	4287·93	— 0·62	+·927	—·376	+·701
	16	λ	308 22	382·758	·174	4855·23	4855·26	— 0·03	—·780	+·625	—·716
	17	λ	308 19	382·727	·164	4854·71	4855·62	— 0·91	—·781	+·625	—·698
	18	γ	112 45	337·372	·120	4279·10	4279·90	— 0·80	+·925	—·381	+·590
	19	γ	112 51	337·156	·114	4276·28	4277·07	— 0·79	+·924	—·382	+·548
	20	λ	308 2	382·937	·130	4856·95	4857·85	— 0·90	—·784	+·621	—·580
	21	λ	307 59	382·992	·127	4857·61	4858·19	— 0·58	—·784	+·620	—·562
	22	γ	112 59	336·933	·108	4273·37	4273·22	+ 0·15	+·923	—·384	+·489
I_7	23	γ	120 52	324·706	0·448	4123·47	4124·05	— 0·58	+·858	—·513	+·888
	24	λ	300 58	387·958	·544	4926·84	4926·28	+ 0·56	—·858	+·515	—·881
	25	λ	300 56	387·997	·503	4926·80	4926·91	— 0·11	—·858	+·514	—·872
	26	γ	120 59	324·723	·366	4122·65	4122·35	+ 0·30	+·857	—·515	+·863
	27	γ	121 1	324·677	·348	4121·84	4121·88	— 0·04	+·857	—·515	+·857
	28	λ	300 51	388·316	·420	4929·79	4928·59	+ 1·20	—·859	+·513	—·846
	29	λ	300 49	388·253	·397	4928·72	4929·13	— 0·41	—·859	+·512	—·838
	30	γ	121 7	324·603	·297	4120·25	4120·26	— 0·01	+·856	—·517	+·829
	31	γ	121 9	324·565	·285	4119·62	4119·79	— 0·17	+·856	—·517	+·821
	32	λ	300 44	388·499	·344	4931·15	4930·73	+ 0·42	—·860	+·511	—·811
	33	λ	300 43	388·548	·330	4931·59	4931·21	+ 0·38	—·860	+·511	—·802
	34	γ	121 15	324·478	·250	4118·07	4118·25	— 0·18	+·855	—·519	+·794
I_8	35	κ	235 17	312·514	0·244	3965·49	3964·31	+ 1·18	—·822	—·570	+·799
	36	ζ	53 24	110·880	·100	1407·13	1406·78	+ 0·35	+·803	+·596	—·822
	37	ζ	53 26	110·509	·107	1402·51	1402·53	— 0·02	+·803	+·596	—·837

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.								
	38	ι	Sept. 23	H	·61515	16° 32′ 10″·90	+16° 19′ 13″·03	+6″·68	−5″·20	+37″·35	+13″·70
	39	γ			·62074	8·02	9·87	+6·53	−5·14	37·65	13·72
	40	γ			·62531	5·67	7·29	+6·40	−5·09	37·65	13·72
II_9	41	ι			·63306	1·68	2·91	+6·18	−5·01	37·35	13·71
	42	ι			·63834	31 58·96	18 59·92	+6·01	−4·95	37·35	13·71
	43	γ			·64567	55·19	55·77	+5·77	−4·88	37·65	13·72
	44	γ			·65023	52·84	53·19	+5·61	−4·84	37·65	13·72
	45	ι			·65761	49·04	49·02	+5·35	−4·77	37·35	13·71
	46	κ	Sept. 23	E	·94096	16 29 22·24	+16 16 7·91	−6·76	−5·25	+37·61	+13·49
II_{10}	47	κ			·94400	20·65	6·18	−6·84	−5·28	37·61	13·49
	48	α			·94775	18·80	4·03	−6·93	−5·33	37·45	13·99
	49	θ	Sept. 26	H	·90759	16 2 23·78	+15 46 32·00	−6·12	−5·08	+38·04	+14·09
	50	α			·91796	17·89	25·52	−6·43	−5·19	37·95	14·34
	51	α			·92290	15·08	22·43	−6·57	−5·24	37·95	14·34
II_{11}	52	θ			·92844	11·92	18·97	−6·72	−5·30	38·04	14·09
	53	θ			·93350	9·04	15·81	−6·85	−5·36	38·04	14·09
	54	α			·93943	5·67	12·10	−6·99	−5·43	37·95	14·35
	55	α			·94492	2·55	8·66	−7·12	−5·49	37·95	14·35
	56	θ			·95015	1 59 57	5·39	−7·23	−5·55	38·04	14·09
	57	γ	Sept. 27	H	·58217	15 55 57·13	+15 39 26·51	+7·21	−5·55	+38·31	+14·23
	58	η			·58811	53·70	22·73	+7·08	−5·48	37·87	14·42
	59	η			·59263	51·09	19·85	+6·97	−5·43	37·87	14·42
	60	γ			·59737	48·34	16·83	+6·86	−5·38	38·31	14·23
	61	γ			·60184	45·76	13·98	+6·75	−5·33	38·31	14·23
II_{12}	62	η			·60681	42·88	10·81	+6·61	−5·27	37·87	14·42
	63	η			·61133	40·27	7·93	+6·49	−5·23	37·87	14·42
	64	γ			·61562	37·79	5·20	+6·36	−5·18	38·31	14·24
	65	γ			·62090	34·74	1·84	+6·20	−5·13	38·31	14·24
	66	η			·62591	31·84	38 58·65	+6·05	−5·08	37·87	14·42
	67	η			·62977	29·61	56·19	+5·92	−5·04	37·87	14·42
	68	γ			·63452	26·86	53·16	+5·76	−4·99	38·31	14·24
	69	α		E	·89546	15 52 55·47	+15 36 6·30	−5·83	−5·02	+38·09	+14·45
	70	ζ			·89946	53·14	3·73	−5·96	−5·06	38·21	14·26
	71	ζ			·90254	51·36	1·76	−6·06	−5·09	38·21	14·26
	72	α			·90793	48·22	35 58·30	−6·23	−5·15	38·10	14·46
	73	α			·91246	45·58	55·39	−6·37	−5·19	38·10	14·46
	74	ζ			·91602	43·51	53·10	−6·47	−5·23	38·21	14·27
II_{13}	75	ζ			·91883	41·88	51·30	−6·55	−5·26	38·21	14·27
	76	α			·92253	39·72	48·92	−6·66	−5·30	38·10	14·46
	77	α			·92531	38·11	47·14	−6·73	−5·33	38·10	14·46
	78	ζ			·92835	36·34	45·19	−6·81	−5·36	38·22	14·27
	79	ζ			·93156	34·47	43·12	−6·89	−5·40	38·22	14·27
	80	α			·93537	32·25	40·68	−6·98	−5·44	38·10	14·46

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Set.	Rotation No.	Star.	Approximate Position Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
	38	ι	326 29	261·864	0·221	3323·00	3321·50	+1·50	—·552	+·834	—·787
	39	γ	131 30	319·794	·254	4057·92	4059·35	—1·43	+·749	—·663	+·810
	40	γ	131 33	319·978	·241	4060·10	4059·26	+0·84	+·748	—·663	+·797
	41	ι	326 16	261·586	·180	3318·96	3318·41	+0·55	—·555	+·832	—·746
II_9	42	ι	326 11	261·518	·171	3317·98	3317·52	+0·46	—·557	+·831	—·733
	43	γ	131 46	319·987	·196	4059·63	4058·83	+0·80	+·746	—·666	+·737
	44	γ	131 49	320·006	·186	4059·76	4058·74	+1·02	+·745	—·667	+·724
	45	ι	325 56	261·343	·145	3315·43	3314·31	+1·11	—·560	+·828	—·682
	46	κ	233 3	370·111	0·333	4697·82	4697·77	+0·05	—·799	—·601	+·834
II_{10}	47	κ	233 3	370·249	·347	4699·75	4700·11	—0·36	—·799	—·601	+·843
	48	α	43 31	387·696	·407	4921·77	4922·23	—0·46	+·689	+·725	—·844
	49	θ	239 9	223·852	0·150	2840·14	2840·35	—0·21	—·859	—·513	+·767
	50	α	45 38	201·906	·161	2562·03	2561·58	+0·45	+·715	+·699	—·804
	51	α	45 39	201·544	·170	2557·56	2557·35	+0·21	+·715	+·699	—·818
	52	θ	239 3	225·214	·195	2858·00	2857·45	+0·55	—·858	—·514	+·827
II_{11}	53	θ	239 2	225·600	·210	2863·07	2861·59	+1·48	—·857	—·515	+·841
	54	α	45 40	200·350	·216	2543·00	2543·22	—0·22	+·715	+·699	—·861
	55	α	45 40	199·975	·236	2538·50	2538·54	—0·04	+·715	+·699	—·874
	56	θ	238 57	226·478	·274	2875·01	2875·19	—0·18	—·857	—·516	+·882
	57	γ	169 15	407·102	0·330	5165·87	5164·54	+1·33	+·187	—·983	+·676
	58	η	345 5	454·866	·395	5772·30	5772·30	0·00	—·257	+·966	—·705
	59	η	345 3	454·862	·372	5771·96	5770·24	+1·72	—·258	+·966	—·698
	60	γ	169 22	407·782	·273	5173·78	5172·26	+1·52	+·185	—·983	+·652
	61	γ	169 24	407·958	·261	5175·84	5174·54	+1·30	+·184	—·983	+·645
II_{12}	62	η	344 57	454·332	·315	5764·51	5763·81	+0·70	—·260	+·966	—·675
	63	η	344 55	454·143	·301	5761·94	5761·75	+0·19	—·260	+·966	—·667
	64	γ	169 31	408·558	·230	5183·06	5181·57	+1·49	+·182	—·984	+·621
	65	γ	169 33	408·717	·220	5184·95	5184·26	+0·69	+·182	—·984	+·614
	66	η	344 49	453·691	·264	5755·74	5755·18	+0·56	—·262	+·965	—·644
	67	η	344 47	453·556	·256	5753·94	5753·45	+0·49	—·262	+·965	—·636
	68	γ	169 39	409·261	·201	5191·61	5191·22	+0·39	+·180	—·984	+·591
	69	α	47 46	137·347	0·089	1742·92	1743·13	—0·21	+·741	+·672	—·754
	70	ζ	214 34	203·557	·130	2583·08	2583·61	—0·53	—·567	—·823	+·742
	71	ζ	214 34	203·803	·135	2586·26	2586·28	—0·02	—·567	—·823	+·750
	72	α	47 48	136·443	·101	1731·61	1732·21	—0·60	+·741	+·672	—·792
	73	α	47 49	136·177	·107	1728·30	1728·24	+0·06	+·741	+·672	—·803
	74	ζ	214 36	204·708	·156	2598·02	2598·05	—0·03	—·568	—·823	+·783
II_{13}	75	ζ	214 37	204·927	·162	2600·86	2600·49	+0·37	—·568	—·823	+·791
	76	α	47 50	135·389	·121	1718·48	1719·44	—0·96	+·741	+·671	—·831
	77	α	47 51	135·221	·125	1716·40	1717·02	—0·62	+·741	+·671	—·839
	78	ζ	214 38	205·608	·183	2609·76	2608·78	+0·98	—·568	—·823	+·813
	79	ζ	214 39	205·814	·191	2612·47	2611·58	+0·89	—·569	—·823	+·822
	80	α	47 53	134·526	·144	1707·83	1708·25	—0·42	+·742	+·670	—·864

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.								
	81	z	Sept. 28	E	·58317	15° 46′ 12″·41	+15° 28′ 41″·19	+7″·12	−5″·53	+38″·26	+14″·54
	82	δ			·59251	6·90	35·10	+6·91	−5·43	38·16	14·47
	83	δ			·60115	1·80	29·45	+6·69	−5·33	38·16	14·47
	84	z			·60482	45 59·63	27·06	+6·59	−5·29	38·26	14·55
	85	z			·60758	58·00	25·26	+6 51	−5·26	38·27	14·55
III$_7$	86	δ			·61416	54·11	20·96	+6·32	−5·19	38·16	14·48
	87	δ			·61814	51·76	18·36	+6·20	−5·15	38·17	14·48
	88	z			·62065	50·28	16·72	+6·12	−5·13	38·27	14·55
	89	z			·62327	48·73	15·01	+6·04	−5·10	38·27	14·55
	90	δ			·62629	46·95	13·04	+5·94	−5·07	38·17	14·48
	91	y*	Sept. 28	H	·88524	15 43 13·60	+15 25 23·30	−5·59	−4·99	+38·13	+14·71
	92	ζ			·89968	5·02	13·80	−6·08	−5·13	38·37	14·38
	93	ζ			·90586	1·35	9·73	−6·27	−5·19	38·37	14·38
	94	y*			·91160	42 57·94	5·96	−6·44	−5·25	38·13	14·71
	95	y*			·91657	54·99	2·69	−6·58	−5·30	38·13	14·71
III$_8$	96	ζ			·92500	49·98	24 57·14	−6·81	−5·39	38·37	14·39
	97	ζ			·92982	47·12	53·97	−6·93	−5·44	38·37	14·39
	98	y*			·93629	43·27	49·71	−7·08	−5·52	38·14	14·71
	99	y*			·94146	40·20	46·31	−7·19	−5·58	38·14	14·71
	100	ζ			·94680	37·03	42·79	−7·30	−5·64	38·37	14·39
	101	α	Oct. 1	E	·86779	15 12 59·33	+14 51 36·08	−5·32	−5·01	+38·66	+14·90
	102	y*			·87385	55·57	31·84	−5·54	−5·06	38·54	15·02
	103	y*			·87896	52·39	28·25	−5·72	−5·11	38·54	15·02
	104	α			·88304	49·86	25·39	−5·86	−5·14	38·66	14·90
	105	α			·88667	47·60	22·85	−5·98	−5·18	38·66	14·90
III$_9$	106	y*			·89060	45·16	20·09	−6·11	−5·21	38·54	15·02
	107	y*			·89465	42·65	17·25	−6·24	−5·25	38·54	15·02
	108	α			·89816	40·47	14·79	−6·34	−5·29	38·66	14·90
	109	α			·90068	38·90	13·03	−6·42	−5·31	38·66	14·90
	110	y*			·90487	36·30	10·09	−6·54	−5·36	38·54	15·02
	111	u	Oct. 2	E	·57200	15 5 40·58	+14 43 19·50	+7·10	−5·61	+38·78	+15·11
	112	η			·57556	38·35	16·97	+7·02	−5·57	38·60	14·93
	113	η			·57914	36·11	14·43	+6·94	−5·53	38·60	14·93
	114	u			·58301	33·69	11·68	+6·84	−5·49	38·78	15·12
	115	u			·58586	31·91	9·66	+6·77	−5·46	38·78	15·12
	116	η			·58900	29·95	7·43	+6·68	−5·43	38·60	14·94
III$_{10}$	117	η			·59289	27·51	4·67	+6·58	−5·39	38·60	14·94
	118	u			·59666	25·15	1·99	+6·47	−5·35	38·78	15·12
	119	u			·60042	22·80	42 59·32	+6·36	−5·31	38·78	15·12
	120	η			·60313	21·10	57·40	+6·28	−5·29	38·60	14·94
	121	η			·60627	19·14	55·17	+6·18	−5·26	38·60	14·94
	122	u			·61080	16·31	51·95	+6·04	−5·21	38·78	15·12

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
	81	z	111 53	187·820	0·199	2384·38	2384·69	—0·31	+·928	—·373	+·843
	82	δ	321 49	139·959	·138	1776·65	1776·78	—0·13	—·618	+·736	—·839
	83	δ	321 34	139·914	·122	1775·88	1775·60	+0·28	—·622	+·783	—·819
	84	z	112 18	187·352	·146	2377·77	2378·06	—0·29	+·925	—·380	+·789
	85	z	112 22	187·249	·141	2376·40	2377·21	—0·81	+·925	—·381	+·781
III_7	86	δ	321 12	139·772	·104	1773·86	1773·93	—0·07	—·627	+·779	—·787
	87	δ	321 6	139·756	·100	1773·60	1773·27	+0·33	—·628	+·778	—·776
	88	z	112 37	187·017	·121	2373·22	2373·22	0·00	+·923	—·385	+·742
	89	z	112 40	187·019	·118	2373·21	2372·42	+0·79	+·923	—·386	+·734
	90	δ	320 52	139·709	·092	1772·90	1772·44	+0·45	—·631	+·776	—·755
	91	y*	34 4	352·953	0·213	4477·83	4476·49	+1·34	+·560	+·828	—·714
	92	ζ	216 12	271·296	·181	3442·08	3441·92	+0·16	—·591	—·807	+·761
	93	ζ	216 12	271·670	·193	3446·98	3447·45	—0·47	—·591	—·807	+·776
	94	y*	34 2	350·997	·277	4453·84	4452·99	+0·85	+·559	+·829	—·782
	95	y*	34 1	350·628	·294	4449·37	4448·56	+0·81	+·559	+·829	—·793
III_8	96	ζ	216 14	272·962	·244	3464·01	3464·57	—0·56	—·591	—·807	+·823
	97	ζ	216 14	273·353	·262	3469·19	3468·86	+0·33	—·591	—·807	+·835
	98	y*	33 59	349·158	·387	4431·93	4431·03	+0·90	+·559	+·829	—·839
	99	y*	33 59	348·761	·420	4427·30	4426·45	+0·85	+·559	+·829	—·850
	100	ζ	216 16	274·433	·343	3483·91	3484·00	—0·09	—·592	—·806	+·871
	101	α	214 16	142·896	0·078	1813·14	1813·59	—0·45	—·563	—·826	+·704
	102	y*	24 9	144·728	·079	1836·40	1837·06	—0·66	+·409	+·913	—·680
	103	y*	24 6	144·425	·083	1832·59	1832·41	+0·18	+·409	+·913	—·692
	104	α	214 19	144·021	·089	1827·55	1827·98	—0·43	—·564	—·826	+·744
	105	α	214 20	144·337	·093	1831·61	1831·41	+0·20	—·564	—·826	+·754
III_9	106	y*	24 0	143·594	·091	1822·16	1821·86	+0·30	+·407	+·914	—·717
	107	y*	23 58	143·300	·094	1818·48	1818·20	+0·28	+·407	+·914	—·725
	108	α	214 23	145·137	·105	1841·90	1842·24	—0·34	—·565	—·825	+·781
	109	α	214 23	145·317	·108	1844·22	1844·61	—0·39	—·565	—·825	+·783
	110	y*	23 52	142·504	·104	1808·50	1808·94	—0·44	+·405	+·915	—·746
	111	u	137 2	319·474	0·355	4055·94	4056·37	—0·43	+·682	—·731	+·878
	112	η	296 38	388·619	·427	4933·73	4933·65	+0·08	—·894	+·448	—·857
	113	η	296 35	388·712	·403	4934·60	4934·55	+0·05	—·894	+·448	—·848
	114	u	137 10	319·637	·301	4057·34	4057·33	+0·01	+·680	—·733	+·852
	115	u	137 13	319·584	·289	4056·51	4057·58	—1·07	+·679	—·734	+·846
	116	η	296 29	388·980	·348	4937·31	4937·04	+0·27	—·895	+·446	—·820
III_{10}	117	η	296 27	389·064	·330	4938·15	4938·04	+0·11	—·895	+·445	—·809
	118	u	137 21	319·792	·253	4058·68	4058·52	+0·16	+·677	—·735	+·817
	119	u	137 24	319·756	·240	4058·06	4058·85	—0·79	+·677	—·736	+·807
	120	η	296 20	389·305	·289	4940·67	4940·69	—0·02	—·896	+·444	—·778
	121	η	296 18	389·410	·280	4941·89	4941·51	+0·38	—·897	+·443	—·769
	122	u	137 33	319·843	·216	4058·86	4059·77	—0·91	+·675	—·738	+·779

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	123	α	Oct. 2	H	·88316	15 2 25·76	+14 39 38·08	−5·97	−5·20	+38·79	+15·00
	124	x			·88986	21·56	33·30	−6·18	−5·26	38·66	15·15
	125	x			·89444	18·69	30·03	−6·33	−5·31	38·66	15·15
	126	α			·89921	15·70	26·62	−6·47	−5·36	38·79	15·00
	127	α			·90342	13·06	23·62	−6·59	−5·40	38·79	15·00
III_{11}	128	x			·90926	9·40	19·45	−6·74	−5·46	38·66	15·15
	129	x			·91426	6·27	15·88	−6·87	−5·51	38·66	15·15
	130	α			·92024	2·52	11·61	−7·02	−5·58	38·80	15·01
	131	α			·92471	1 59·71	8·42	−7·12	−5·62	38·80	15·01
	132	x			·93077	55·91	4·09	−7·25	−5·69	38·66	15·15
	133	x			·93683	52·11	38 59·76	−7·36	−5·76	38·66	15·15
	134	α			·94651	46·04	52·85	−7·53	−5·87	38·80	15·01
	137	x	Oct. 3	H	·57221	14 55 12·58	+14 31 23·58	+7·03	−5·59	+38·74	+15·21
	139	y*			·58765	2·84	12·43	+6·63	−5·43	38·75	15·19
IV_7	141	y*			·59382	54 58·95	7·97	+6·46	−5·37	38·75	15·19
	143	x			·60839	49·76	30 57·45	+6·01	−5·23	38·74	15·21
	145	x			·63280	34·37	39·83	+5·15	−5·02	38·74	15·22
			2 pointings	in	each obs.						
	147	x	Oct. 3	E	·86556	14 52 7·47	+14 27 51·35	−5·47	−5·10	+38·77	+15·24
	149	y*			·87339	2·53	45·68	−5·75	−5·17	38·78	15·22
IV_8	151	y*			·88066	51 57·94	40·41	−5·99	−5·23	38·79	15·22
	153	x			·88824	53·16	34·91	−6·23	−5·30	38·78	15·24
	159	x	Oct. 4	E	·58001	14 44 35·37	+14 19 10·49	+6·75	−5·50	+38·86	+15·31
	161	x			·58656	31·22	5·69	+6·57	−5·43	38·86	15·31
IV_9	163	x			·59342	26·87	0·66	+6·37	−5·37	38·86	15·31
	169	x			·61209	15·03	18 46·97	+5·77	−5·20	38·86	15·31
	171	x			·61896	10·67	41·94	+5·53	−5·14	38·86	15·31
	173	x	Oct. 4	H	·86926	14 41 31·87	+14 15 38·05	−5·71	−5·19	+38·89	+15·34
	175	x			·87941	25·42	30·57	−6·05	−5·28	38·89	15·34
	177	x			·88975	18·86	22·96	−6·37	−5·37	38·89	15·34
	179	x			·89212	17·35	21·22	−6·44	−5·40	38·89	15·34
IV_{10}	181	x			·90237	10·84	13·68	−6·73	−5·50	38·89	15·34
	183	x			·90489	9·24	11·82	−6·79	−5·52	38·90	15·34
	189	x			·93386	40 50·85	14 50·49	−7·42	−5·83	38·90	15·34
	191	x			·93678	48·99	48·34	−7·47	−5·87	38·90	15·34

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
	123	α	216 24	217·121	0·144	2754·74	2754·42	+0·32	—·593	—·805	+·761
	124	x	34 54	105·422	·076	1337·62	1337·29	+0·33	+·573	+·820	—·774
	125	x	34 53	105·032	·079	1332·73	1332·90	—0·17	+·573	+·820	—·785
	126	α	216 25	218·270	·173	2769·66	2769·83	—0·17	—·594	—·805	+·803
	127	α	216 26	218·669	·182	2774·83	2773·87	+0·96	—·594	—·805	+·813
III_{11}	128	x	34 49	103·894	·094	1318·48	1318·73	—0·25	+·571	+·821	—·820
	129	x	34 47	103·553	·101	1314·25	1313·95	+0·30	+·571	+·821	—·831
	130	α	216 27	219·827	·230	2790·14	2789·98	+0·16	—·594	—·804	+·852
	131	α	216 28	220·199	·247	2795·07	2794·25	+0·82	—·594	—·804	+·860
	132	x	34 43	102·226	·130	1297·78	1298·20	—0·42	+·570	+·822	—·867
	133	x	34 41	101·833	·145	1293·00	1292·42	+0·58	+·570	+·822	—·879
	134	α	216 30	221·730	·370	2816·03	2815·08	+0·95	—·595	—·804	+·905
	137	x	30 52	55·743	0·016	706·97	706·79	+0·18	+·513	+·858	—·131
	139	y*	328 55	41·957	·034	532·41	532·86	—0·45	—·516	+·856	—·796
IV_7	141	y*	328 19	41·984	·032	532·72	531·15	+1·57	—·525	+·851	—·785
	143	x	30 19	53·018	·016	672·42	672·86	—0·44	+·505	+·863	—·157
	145	x	29 53	51·204	·016	649·42	649·90	—0·48	+·499	+·867	—·187
	147	x	23 27	33·879	0·018	429·87	430·43	—0·56	+·398	+·918	—·680
	149	y*	298 25	41·324	·013	524·22	525·03	—0·81	—·880	+·476	+·245
IV_8	151	y*	297 40	41·488	·014	526·31	526·65	—0·34	—·886	+·464	+·270
	153	x	22 30	32·261	·020	409·39	409·41	—0·02	+·383	+·924	—·721
	159	x	243 37	22·343	0·008	283·45	284·56	—1·11	—·896	—·444	—·341
	161	x	243 9	22·860	·008	290·00	290·43	—0·43	—·892	—·452	—·322
IV_9	163	x	242 41	23·306	·008	295·66	296·62	—0·96	—·888	—·459	—·301
	169	x	241 30	24·711	·008	313·48	313·60	—0·12	—·879	—·477	—·243
	171	x	241 6	25·177	·008	319·37	319·90	—0·53	—·875	—·483	—·221
	173	x	232 43	43·986	0·027	558·05	559·07	—1·02	—·796	—·606	+·756
	175	x	232 31	44·800	·032	568·43	568·90	—0·47	—·794	—·609	+·788
	177	x	232 19	45·605	·036	578·69	578·88	—0·19	—·791	—·611	+·815
	179	x	232 16	45·721	·038	580·18	581·17	—0·99	—·791	—·612	+·823
IV_{10}	181	x	232 4	46·495	·043	590·06	591·06	—1·00	—·789	—·615	+·852
	183	x	232 2	46·750	·046	593·33	593·50	—0·17	—·788	—·615	+·859
	189	x	231 30	48·898	·080	621·00	621·37	—0·37	—·783	—·623	+·925
	191	x	231 27	49·167	·085	624·47	624·18	+0·29	—·782	—·623	+·931

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	193	x	Oct. 5	H	·56227	14 34 11·42	+14 7 5·55	+7·09	−5·67	+38·97	+15·40
	195	t			·56982	6·62	6 59·94	+6·92	−5·59	38·86	15·51
	197	t			·57480	3·45	56·24	+6·79	−5·54	38·86	15·51
	199	x			·58037	33 59·91	52·10	+6·65	−5·48	38·97	15·40
IV_{11}	201	x			·58559	56·59	48·22	+6·50	−5·43	38·97	15·40
	203	t			·59348	51·56	42·36	+6·27	−5·36	38·86	15·51
	205	t			·60018	47·29	37·38	+6·06	−5·30	38·86	15·51
	207	x			·60736	42·72	32·04	+5·82	−5·23	38·97	15·41
	209*	x			·61277	39·28	28·02	+5·63	−5·19	38·97	15·41
			2 pointings	in	each obs.						
	211	t	Oct. 7	H	·64846	14 12 2·92	+13 40 55·78	+3·97	−4·94	+39·06	+15·69
	213	t			·65058	1·57	54·16	+3·88	−4·93	39·06	15·69
IV_{12}	215	t			·65799	11 56·85	48·52	+3·55	−4·89	39·06	15·69
	217	t			·66230	54·10	45·24	+3·36	−4·87	39·06	15·69
	219	t			·66817	50·37	40·78	+3·09	−4·84	39·07	15·69
			2 pointings	in	each obs.						
	221	t	Oct. 7	E	·84567	14 9 57·45	+13 38 25·51	−5·19	−5·15	+39·08	+15·71
	222	t			·85015	54·60	22·09	−5·36	−5·18	39·08	15·71
	223	t			·85346	52·49	19·56	−5·48	−5·21	39·08	15·71
IV_{13}	225	t			·85792	49·66	16·16	−5·63	−5·24	39·08	15·71
	226	t			·86129	47·51	13·59	−5·75	−5·27	39·08	15·71
	227	t			·86669	44·08	9·47	−5·93	−5·32	39·08	15·71
	232	m	Oct. 10	E	·55571	13 41 24·55	+13 3 34·21	+6·82	−5·65	+39·29	+16·11
	233	v			·56045	21·57	30·52	+6·70	−5·61	39·18	15·92
	234	v			·56450	19·03	27·37	+6·59	−5·57	39·18	15·92
	235	m			·56998	15·60	23·09	+6·44	−5·52	39·29	16·11
V_6	236	m			·57545	12·18	18·83	+6·28	−5·47	39·29	16·11
	237	v			·57968	9·53	15·53	+6·15	−5·44	39·18	15·92
	238	v			·58336	7·23	12·66	+6·04	−5·41	39·18	15·92
	239	m			·58632	5·37	10·36	+5·94	−5·38	39·30	16·11
	240	x	Oct. 10	H	·84934	13 38 20·87	+12 59 45·14	−5·64	−5·32	+39·48	+15·87
V_7	241	l			·86682	9·95	31·50	−6·21	−5·46	39·06	16·12
	242	l			·87403	5·45	25·86	−6·42	−5·52	39·06	16·13
	243	x			·88532	37 58·40	17·05	−6·73	−5·62	39·49	15·87

* No. 209 has not been included in the mean equation formed from the set.

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
	193	x	225 16	95·364	0·028	1209·48	1210·05	− 0·57	−·710	−·704	−·089
	195	t	38 52	166·113	·047	2106·76	2107·64	− 0·88	+·627	+·778	−·014
	197	t	38 51	165·838	·046	2103·26	2102·79	+ 0·47	+·627	+·779	−·019
	199	x	225 12	96·920	·028	1229·21	1227·62	+ 1·59	−·710	−·705	−·072
IV_{11}	201	x	225 11	97·215	·028	1232·95	1232·70	+ 0·25	−·709	−·705	−·065
	203	t	38 50	164·364	·046	2084·57	2084·57	0·00	+·627	+·779	−·037
	205	t	38 49	163·980	·046	2079·70	2078·00	+ 1·70	+·627	+·779	−·044
	207	x	225 8	98·886	·028	1254·14	1253·99	+ 0·15	−·709	−·705	−·032
	209	x	225 7	99·309	·028	1259·50	1259·29	+ 0·21	−·709	−·706	−·022
	211	t	23 51	6·789	0·002	86·10	84·77	+ 1·33	+·405	+·915	−·296
	213	t	23 25	6·487	·002	82·27	82·74	− 0·47	+·397	+·918	−·303
IV_{12}	215	t	21 42	6·001	·002	76·11	75·68	+ 0·43	+·370	+·929	−·326
	217	t	20 32	5·704	·002	72·35	71·61	+ 0·74	+·350	+·937	−·343
	219	t	18 44	5·350	·002	67·86	66·13	+ 1·73	+·321	+·947	−·362
	221	t	232 55	9·490	0·006	120·42	121·03	− 0·61	−·798	−·603	+·713
	222	t	232 28	9·894	·006	125·55	125·46	+ 0·09	−·793	−·609	+·729
	223	t	232 9	10·052	·007	127·56	128·74	− 1·18	−·790	−·614	+·742
IV_{13}	225	t	231 45	10·369	·008	131·60	133·13	− 1·53	−·785	−·619	+·753
	226	t	231 28	10·660	·008	135·29	136·48	− 1·19	−·782	−·623	+·766
	227	t	231 2	11·147	·008	141·46	141·82	− 0·36	−·778	−·629	+·784
	232	m	140 9	414·331	0·421	5259·72	5259·19	+ 0·53	+·641	−·768	+·860
	233	v	313 57	245·095	·251	3111·39	3110·65	+ 0·74	−·720	+·694	−·860
	234	v	313 52	245·004	·237	3110·05	3110·36	− 0·31	−·721	+·693	−·849
	235	m	140 18	414·589	·346	5262·05	5261·85	+ 0·20	+·639	−·769	+·826
V_6	236	m	140 21	414·625	·324	5262·22	5262·87	− 0·65	+·638	−·770	+·812
	237	v	313 36	245·013	·195	3109·63	3109·28	+ 0·35	−·724	+·690	−·810
	238	v	313 32	244·985	·187	3109·17	3109·03	+ 0·14	−·725	+·689	−·799
	239	m	140 28	414·829	·288	5264·35	5264·91	− 0·56	+·636	−·771	+·783
	240	x	220 10	504·714	0·323	6403·41	6402·39	+ 1·02	−·645	−·764	+·761
	241	l	46 52	362·539	·301	4600·50	4600·78	− 0·28	+·729	+·684	−·815
V_7	242	l	46 52	361·973	·329	4593·67	4593·53	+ 0·14	+·729	+·684	−·835
	243	x	220 10	507·332	·489	6438·71	6438·90	− 0·19	−·645	−·764	+·853

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	244	f	Oct. 15	H	·54322	12 50 57·10	+11 58 8·98	+6·64	−5·67	+39·33	+16·57
	245	s			·55471	50·41	57 59·90	+6·33	−5·57	39·35	16·26
	246	s			·56098	46·76	54·94	+6·15	−5·52	39·35	16·26
VI_6	247	f			·56891	42·15	48·68	+5·91	−5·46	39·33	16·57
	248	f			·57499	38·61	43·88	+5·71	−5·42	39·33	16·57
	249	s			·58122	34·98	38·95	+5·50	−5·37	39·35	16·26
	250	s			·58706	31·58	34·34	+5·30	−5·33	39·35	16·26
	251	f			·59377	27·69	29·03	+5·05	−5·29	39·33	16·58
	252	v	Oct. 15	E	·82807	12 48 11·79	+11 54 23·89	−5·38	−5·35	+39·54	+16·26
	253	c			·83227	9·36	20·57	−5·53	−5·38	39·07	16·56
	254	c			·83607	7·16	17·57	−5·65	−5·41	39·07	16·56
VI_7	255	v			·84049	4·61	14·08	−5·80	−5·44	39·54	16·26
	256	v			·84553	1·70	10·10	−5·96	−5·48	39·54	16·26
	257	c			·84945	47 59·43	7·00	−6·08	−5·51	39·07	16·57
	258	c			·85418	56·70	3·26	−6·22	−5·54	39·07	16·57
	259	v			·85921	53·79	53 59·29	−6·36	−5·58	39·54	16·26
	260	f	Oct. 16	E	·53266	12 41 27·39	+11 45 7·44	+6·80	−5·73	+39·37	+16·64
	261	r			·53669	25·10	4·26	+6·70	−5·70	39·32	16·28
	262	r			·54026	23·07	1·45	+6·61	−5·67	39·32	16·28
VI_8	263	f			·54454	20·63	44 58·07	+6·50	−5·63	39·37	16·64
	264	f			·54802	18·65	55·32	+6·41	−5·61	39·37	16·64
	265	r			·55223	16·25	52·00	+6·29	−5·57	39·32	16·28
	266	r			·55712	13·47	48·14	+6·15	−5·53	39·32	16·28
	267	f			·56066	11·46	45·35	+6·04	−5·51	39·37	16·64
	268	v	Oct. 16	H	·82594	12 38 40·98	+11 41 16·01	−5·40	−5·37	+39·60	+16·32
	269	e			·83569	35·47	8·32	−5·73	−5·44	39·10	16·62
	270	c			·84296	31·36	2·58	−5·96	−5·49	39·10	16·62
	271	v			·85167	26·44	40 55·72	−6·22	−5·56	39·60	16·32
VI_9	272	v			·85861	22·52	50·25	−6·41	−5·61	39·60	16·32
	273	c			·86703	17·76	43·60	−6·63	−5·68	39·10	16·62
	274	c			·87437	13·61	37·81	−6·81	−5·74	39·10	16·62
	275	v			·88077	10·00	32·76	−6·95	−5·80	39·60	16·33
	276	e	Oct. 17	H	·53178	12 32 5·52	+11 31 59·74	+6·72	−5·72	+39·28	+16·67
	277	r			·53844	1·82	54·49	+6·55	−5·66	39·37	16·33
	278	r			·54311	31 59·23	50·81	+6·43	−5·63	39·37	16·33
	279	e			·55157	54·54	44·15	+6·20	−5·56	39·28	16·68
VI_{10}	280	e			·55869	50·59	38·54	+5·99	−5·51	39·28	16·68
	281	r			·56399	47·64	34·37	+5·82	−5·47	39·37	16·33
	282	r			·56826	45·27	31·01	+5·68	−5·44	39·37	16·33
	283	e			·57500	41·53	25·71	+5·46	−5·39	39·28	16·68

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
	244	f	133 23	446·975	0·445	5672·88	5673·50	—0·62	+·726	—·687	+·861
	245	s	302 11	344·316	·307	4369·51	4369·23	+0·28	—·846	+·533	—·821
	246	s	302 6	344·448	·282	4370·87	4369·80	+1·07	—·847	+·531	—·802
VI_6	247	f	133 38	447·371	·321	5676·34	5676·27	+0·07	+·724	—·690	+·796
	248	f	133 42	447·469	·302	5677·33	5676·93	+0·40	+·723	—·691	+·779
	249	s	301 51	344·557	·223	4371·51	4371·76	—0·25	—·849	+·528	—·740
	250	s	301 46	344·691	·210	4373·05	4372·36	+0·69	—·850	+·526	—·720
	251	f	133 53	447·655	·253	5679·07	5678·98	+0·09	+·720	—·693	+·722
	252	v	249 42	451·604	0·255	5730·29	5730·44	—0·15	—·938	—·347	+·679
	253	c	67 52	506·797	·321	6431·07	6430·29	+0·78	+·926	+·377	—·705
	254	c	67 53	506·500	·333	6427·45	6427·05	+0·40	+·926	+·377	—·717
VI_7	255	v	249 38	452·448	·289	5741·44	5740·86	+0·58	—·937	—·348	+·722
	256	v	249 37	452·727	·307	5745·21	5745·09	+0·12	—·937	—·348	+·738
	257	c	67 56	505·518	·392	6415·75	6415·66	+0·09	+·927	+·376	—·759
	258	c	67 58	505·188	·416	6411·88	6411·64	+0·24	+·927	+·375	—·773
	259	v	249 32	453·587	·364	5756·84	5756·54	+0·30	—·937	—·350	+·778
	260	f	142 40	463·514	0·514	5884·62	5884·41	+0·21	+·607	—·795	+·860
	261	r	315 13	464·273	·547	5894·67	5893·40	+1·27	—·704	+·710	—·867
	262	r	315 11	464·221	·518	5893·63	5892·90	+0·73	—·705	+·709	—·859
VI_8	263	f	142 46	463·877	·433	5888·29	5887·62	+0·58	+·605	—·796	+·834
	264	f	142 48	463·934	·413	5888·67	5888·57	+0·10	+·605	—·797	+·827
	265	r	315 4	464·121	·436	5891·33	5891·23	+0·10	—·706	+·708	—·830
	266	r	315 2	464·144	·408	5891·28	5890·55	+0·73	—·707	+·708	—·818
	267	f	142 55	464·312	·356	5892·73	5891·99	+0·74	+·603	—·798	+·796
	268	v	244 56	516·499	0·311	6552·69	6552·07	+0·62	—·906	—·424	+·706
	269	c	73 11	444·376	·295	5638·03	5636·97	+1·06	+·957	+·289	—·694
	270	c	73 14	443·838	·321	5631·53	5631·23	+0·30	+·957	+·288	—·717
VI_9	271	v	244 50	518·157	·418	6575·06	6574·43	+0·63	—·905	—·425	+·788
	272	v	244 48	518·548	·459	6580·54	6580·42	+0·12	—·905	—·426	+·808
	273	c	73 22	442·229	·446	5612·72	5612·38	+0·34	+·958	+·286	—·784
	274	c	73 25	441·739	·500	5607·19	5606·66	+0·53	+·958	+·285	—·802
	275	v	244 43	519·924	·647	6600·38	6599·57	+0·81	—·904	—·427	+·862
	276	e	121 40	353·396	0·389	4485·68	4485·08	+0·60	+·851	—·525	+·860
	277	r	305 48	457·186	·499	5803·03	5801·72	+1·31	—·811	+·585	—·851
	278	r	305 45	457·167	·465	5802·36	5801·75	+0·61	—·812	+·584	—·841
	279	e	121 55	353·356	·294	4483·96	4483·67	+0·29	+·849	—·529	+·809
VI_{10}	280	e	122 0	353·418	·268	4484·42	4483·17	+1·25	+·848	—·530	+·789
	281	r	305 33	457·288	·352	5802·46	5802·03	+0·43	—·814	+·581	—·782
	282	r	305 31	457·394	·335	5803·60	5802·11	+1·49	—·814	+·581	—·769
	283	e	122 12	353·334	·224	4482·80	4481·99	+0·81	+·846	—·533	+·740

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	284	e	Oct. 18	E	·53316	12 22 57·22	+11 18 52·79	+6·58	−5·68	+39·30	+16·73
	285	r			·53790	54·66	49·07	+6·46	−5·64	39·41	16·38
	286	r			·54136	52·79	46·36	+6·37	−5·62	34·41	16·38
	287	e			·54583	50·38	42·85	+6·25	−5·58	39·30	16·73
VI_{11}	288	e			·55099	47·60	38·81	+6·10	−5·54	39·30	16·73
	289	r			·55622	44·78	34·71	+5·94	−5·51	39·41	16·38
	290	r			·56021	42·63	31·58	+5·82	−5·48	39·41	16·38
	291	e			·56511	39·99	27·74	+5·66	−5·44	39·30	16·73
	292	o	Oct. 18	H	·82334	12 20 21·28	+11 15 5·36	−5·48	−5·41	+39·45	+16·56
	293	h			·82976	17·84	0·34	−5·70	−5·45	39·20	16·57
	294	h			·83558	14·73	14 55·78	−5·88	−5·49	39·20	16·57
	295	o			·84207	11·25	50·70	−6·07	−5·54	39·45	16·56
	296	o			·84669	8·78	47·08	−6·21	−5·57	39·45	16·57
	297	h			·85288	5·48	42·23	−6·38	−5·62	39·20	16·58
VI_{12}	298	h			·85831	2·58	37·98	−6·52	−5·66	39·20	16·58
	299	o			·86407	119 59·50	33·47	−6·66	−5·71	39·45	16·57
	300	o			·87169	55·43	27·51	−6·83	−5·77	39·45	16·57
	301	h			·87659	52·82	23·67	−6·94	−5·81	39·20	16·58
	302	h			·88069	50·63	20·46	−7·02	−5·85	39·20	16·58
	303	o			·88528	48·18	16·87	−7·10	−5·89	39·45	16·57
	304	o	Oct. 19	E	·80808	12 11 42·57	+11 2 16·19	−5·04	−5·34	+39·48	+16·61
VII_7	305	d			·81310	39·98	12·29	−5·21	−5·37	39·05	16·64
	306	d			·81634	38·29	9·76	−5·33	−5·39	39·05	16·64
	307	o			·82050	36·14	6·52	−5·47	−5·42	39·48	16·61
	309	c	Oct. 21	H	·59176	11 56 47·04	+10 39 15·69	+4·29	−5·25	+39·21	+16·84
	310	n			·59717	44·42	11·53	+4·08	−5·22	39·25	16·52
	311	n			·60120	42·47	8·44	+3·91	−5·21	39·25	16·52
	312	c			·60660	39·85	4·29	+3·69	−5·18	39·21	16·84
VII_8	313	c			·61089	37·77	0·99	+3·51	−5·16	39·21	16·84
	314	n			·61528	35·64	38 57·61	+3·33	−5·15	39·25	16·52
	315	n			·61933	33·67	54·50	+3·15	−5·13	39·25	16·52
	316	c			·62385	31·48	51·03	+2·95	−5·12	39·21	16·84
	317	o	Oct. 21	E	·79335	11 55 9·63	+10 36 40·89	−4·68	−5·30	+39·52	+16·70
	318	d			·79713	7·81	37·99	−4·82	−5·32	39·08	16·71
	319	d			·79985	6·50	35·90	−4·92	−5·34	39·08	16·71
	320	o			·80265	5·15	33·75	−5·02	−5·35	39·52	16·70
VII_9	321	o			·80615	3·47	31·07	−5·14	−5·37	39·52	16·70
	322	d			·80939	1·91	28·58	−5·26	−5·39	39·08	16·71
	323	d			·81196	0·67	26·61	−5·34	−5·41	39·08	16·71
	324	o			·81520	54 59·12	24·13	−5·45	−5·43	39·52	16·70

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O-C.	f'	f''	f'''
			° ′	r	r	″	″	″			
VI_{11}	284	e	133 45	357·872	0·376	4543·16	4543·16	0·00	+·722	—·692	+·859
	285	r	296 26	461·496	·465	5858·40	5857·50	+0·90	—·895	+·445	—·818
	286	r	296 24	461·533	·441	5858·57	5858·03	+0·54	—·896	+·445	—·810
	287	e	133 54	358·102	·315	4545·31	4544·92	+0·39	+·720	—·694	+·829
	288	e	133 58	358·152	·294	4545·68	4545·63	+0·05	+·719	—·695	+·816
	289	r	296 16	461·844	·361	5861·50	5860·36	+1·14	—·897	+·443	—·768
	290	r	296 14	461·889	·342	5861·84	5860·99	+0·85	—·897	+·442	—·755
	291	e	134 8	358·367	·252	4547·86	4547·61	+0·25	+·717	—·697	+·778
VI_{12}	292	o	223 14	227·485	0·157	2886·30	2885·56	+0·74	—·685	—·729	+·764
	293	h	23 3	223·247	·155	2832·54	2832·23	+0·31	+·392	+·921	—·720
	294	h	23 1	222·757	·164	2826·43	2826·74	—0·31	+·391	+·921	—·731
	295	o	223 11	228·815	·194	2903·63	2903·47	+0·16	—·684	—·729	+·812
	296	o	223 10	229·197	·206	2908·62	2907·90	+0·72	—·684	—·729	+·823
	297	h	22 57	221·485	·198	2810·74	2810·40	+0·34	+·390	+·921	—·762
	298	h	22 56	221·063	·212	2805·57	2805·29	+0·28	+·390	+·921	—·771
	299	o	223 7	23c·386	·265	2924·45	2924·47	—0·02	—·683	—·730	+·863
	300	o	223 6	230·965	·301	2932·24	2931·70	+0·54	—·683	—·730	+·878
	301	h	22 51	219·677	·279	2788·85	2788·08	+0·77	+·389	+·922	—·801
	302	h	22 50	219·257	·301	2783·80	2784·22	—0·42	+·388	+·922	—·807
	303	o	223 4	231·827	·389	2944·30	2944·60	—0·30	—·683	—·731	+·906
VII_7	304	o	220 52	299·292	0·174	3797·71	3797·65	+0·06	—·654	—·756	+·729
	305	d	38 26	443·285	·289	5625·24	5624·46	+0·78	+·622	+·783	—·739
	306	d	38 27	443·064	·299	5622·55	5621·36	+1·19	+·622	+·783	—·748
	307	o	220 51	300·218	·196	3809·73	3809·43	+0·30	—·654	—·756	+·762
VII_8	309	c	125 11	284·782	0·145	3612·62	3612·53	+0·09	+·817	—·577	+·648
	310	n	327 4	416·682	·222	5285·98	5285·53	+0·45	—·544	+·839	—·657
	311	n	327 2	416·555	·217	5284·29	5284·09	+0·20	—·544	+·839	—·647
	312	c	125 24	284·809	·131	3612·78	3612·84	—0·06	+·815	—·580	+·596
	313	c	125 28	284·817	·128	3612·85	3612·94	—0·09	+·814	—·581	+·581
	314	n	326 54	416·130	·199	5278·68	5279·05	—0·37	—·546	+·838	—·610
	315	n	326 51	416·142	·195	5278·78	5277·62	+1·16	—·547	+·837	—·599
	316	c	125 39	284·823	·119	3612·81	3613·25	—0·44	+·813	—·583	+·534
VII_9	317	o	218 9	441·664	0·257	5604·27	5602·99	+1·28	—·618	—·786	+·700
	318	d	41 18	301·176	·190	3821·80	3822·13	—0·33	+·660	+·751	—·713
	319	d	41 19	300·933	·194	3818·77	3819·63	—0·86	+·660	+·751	—·721
	320	o	218 8	442·260	·277	5612·08	5611·89	+0·19	—·618	—·787	+·726
	321	o	218 8	442·517	·286	5615·45	5615·11	+0·34	—·618	—·787	+·736
	322	d	41 20	300·361	·212	3811·75	3810·90	+0·85	+·660	+·751	—·747
	323	d	41 20	300·153	·217	3809·17	3808·55	+0·62	+·660	+·751	—·753
	324	o	218 7	443·173	·313	5624·11	5623·44	+0·67	—·617	—·787	+·758

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
VII_{10}	325	c	Oct. 23	H	·53282	11 41 43·43	+10 14 37·66	+6·04	−5·56	+39·22	+16·91
	326	n			·53887	40·74	33·11	+5·86	−5·52	39·28	16·57
	327	n			·54903	36·21	25·44	+5·55	−5·45	39·28	16·57
	328	c			·55607	33·08	20·14	+5·32	−5·41	39·22	16·91
	329	c			·56073	31·01	16·63	+5·16	−5·39	39·22	16·91
	330	n			·56753	27·98	11·50	+4·93	−5·35	39·28	16·58
	331	n			·57215	25·93	8·01	+4·76	−5·32	39·28	16·58
	332	c			·57738	23·61	4·08	+4·57	−5·30	39·22	16·92
VII_{11}	333	h	Oct. 23	E	·77733	11 39 55·23	+10 11 33·60	−4·26	−5·26	+39·29	+16·76
	334	d			·78136	53·46	30·57	−4·41	−5·28	39·09	16·77
	335	d			·78535	51·70	27·56	−4·56	−5·30	39·09	16·77
	336	h			·78830	50·40	25·35	−4·67	−5·31	39·29	16·76
	337	h			·79163	48·94	22·85	−4·80	−5·33	39·29	16·76
	338	d			·79603	47·00	19·54	−4·95	−5·35	39·09	16·77
	339	d			·80057	45·01	16·13	−5·11	−5·38	39·09	16·77
	340	h			·80365	43·65	13·82	−5·22	−5·40	39·29	16·76

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	r	r	″	″	″			
VII$_{10}$	325	c	149 51	324·537	0·282	4118·41	4117·36	+ 1·05	+·502	—·865	+·779
	326	n	308 9	377·223	·338	4787·13	4786·98	+ 0·15	—·786	+·618	—·794
	327	n	308 3	377·158	·298	4785·80	4786·06	— 0·26	—·787	+·616	—·766
	328	c	150 6	325·218	·221	4126·27	4126·96	— 0·69	+·499	—·867	+·730
	329	c	150 9	325·502	·212	4129·76	4128·89	+ 0·87	+·498	—·867	+·721
	330	n	307 51	377·184	·246	4785·49	4784·43	+ 1·06	—·790	+·614	—·712
	331	n	307 48	377·131	·234	4784·66	4784·04	+ 0·62	—·790	+·613	—·697
	332	c	150 20	325·974	·187	4135·44	4135·83	— 0·39	+·495	—·869	+·683
VII$_{11}$	333	h	226 38	137·899	0·076	1749·76	1748·47	+ 1·29	—·727	—·687	+·666
	334	d	49 59	167·137	·096	2120·78	2121·03	— 0·25	+·766	+·643	—·672
	335	d	50 1	166·859	·100	2117·31	2117·64	— 0·33	+·766	+·643	—·684
	336	h	226 33	138·508	·083	1757·57	1757·92	— 0·35	—·726	—·688	+·699
	337	h	226 32	138·701	·086	1760·04	1760·79	— 0·75	—·726	—·688	+·710
	338	d	50 6	166·139	·109	2108·29	2108·62	— 0·33	+·767	+·642	—·718
	339	d	50 8	165·859	·114	2104·82	2104·79	+ 0·03	+·767	+·641	—·731
	340	h	226 27	139·551	·097	1770·96	1771·13	— 0·17	—·725	—·689	+·744

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TABLE C.—LEIPZIG DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
I_9	1	ε	Sept. 18	P	·34996	17 12 35·48	+17 4 12·22	+6·21	−6·82	+36·71	+12·78
	2	λ			·36044	31·27	7·41	+6·08	−6·71	36·26	12·88
	3	λ			·37997	23·42	3 58·45	+5·77	−6·50	36·26	12·88
	4	ε			·39084	19·05	53·46	+5·56	−6·39	36·72	12·79
	5	ε			·40276	14·25	47·98	+5·29	−6·28	36·72	12·79
	6	λ			·41205	10·51	43·70	+5·07	−6·19	36·27	12·88
	7	λ			·42077	7·00	39·70	+4·84	−6·12	36·27	12·89
	8	ε			·43000	3·27	35·44	+4·59	−6·04	36·73	12·79
I_{10}	9	μ	Sept. 18	P	·64192	17 10 37·25	+17 1 57·46	−3·33	−5·77	+36·64	+12·53
	10	ζ			·65492	31·93	51·41	−3·77	−5·85	36·52	13·07
	11	ζ			·66456	27·99	46·93	−4·08	−5·92	36·52	13·07
	12	μ			·67247	24·75	43·25	−4·33	−5·98	36·65	12·54
	13	μ			·69019	17·49	35·01	−4·83	−6·12	36·65	12·54
	14	ζ			·69954	13·66	30·65	−5·08	−6·20	36·53	13·07
I_{11}	15	ε	Sept. 20	P	·36504	16 58 18·84	+16 48 5·89	+5·95	−6·67	+37·12	+13·08
	16	λ			·37343	15·08	1·68	+5·81	−6·58	36·68	13·15
	17	λ			·38416	10·28	47 56·31	+5·60	−6·48	36·69	13·15
	18	ε			·39271	6·44	52·03	+5·42	−6·39	37·12	13·08
I_{12}	19	κ	Sept. 20	P	·62678	16 56 20·76	+16 45 54·20	−3·03	−5·80	+36·96	+13·04
	20	ζ			·63825	15·55	48·39	−3·44	−5·86	36·92	13·34
	21	ζ			·65399	8·41	40·42	−3·97	−5·97	36·93	13·34
	22	κ			·68577	55 53·95	24·32	−4·91	−6·22	36·97	13·04
I_{13}	23	γ	Sept. 22	P	·36796	16 42 37·99	+16 30 42·79	+5·83	−6·64	+37·41	+13·55
	24	λ			·37951	32·31	36·54	+5·60	−6·53	37·09	13·41
	25	λ			·38629	28·98	32·87	+5·45	−6·47	37·09	13·41
	26	γ			·40032	22·10	25·29	+5·12	−6·34	37·42	13·55
II_{14}	27	γ	Sept. 23	P	·33579	16 34 33·97	+16 21 50·16	+6·28	−6·98	+37·59	+13·68
	28	ι			·34925	27·10	42·62	+6·10	−6·83	37·30	13·67
	29	ι			·35906	22·10	37·13	+5·94	−6·73	37·30	13·67
	30	γ			·37280	15·09	29·44	+5·69	−6·60	37·60	13·68
	31	γ			·38608	8·32	21·99	+5·40	−6·48	37·60	13·68
	32	ι			·39509	3·71	16·93	+5·18	−6·40	37·30	13·68
	33	ι			·40345	35 59·44	12·24	+4·97	−6·32	37·31	13·68
	34	γ			·41151	55·32	7·72	+4·74	−6·26	37·61	13·69

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
I_9	1	ε	129 33	4159·595	7·022	4166·617	4167·270	− 0·653	+·771	−·637	+·892
	2	λ	332 50	5230·308	7·968	5238·276	5238·460	− 0·184	−·457	+·890	−·863
	3	λ	332 42	5228·601	5·985	5234·586	5234·269	+ 0·317	−·459	+·889	−·831
	4	ε	129 53	4162·490	3·907	4166·397	4166·470	− 0·073	+·767	−·642	+·818
	5	ε	129 59	4162·909	3·416	4166·325	4166·230	+ 0·095	+·766	−·643	+·791
	6	λ	332 30	5223·635	4·163	5227·798	5227·465	+ 0·333	−·462	+·887	−·773
	7	λ	332 27	5222·061	3·846	5225·907	5225·641	+ 0·266	−·463	+·887	−·757
	8	ε	130 13	4162·605	2·640	4165·245	4165·641	− 0·396	+·764	−·646	+·725
I_{10}	9	μ	222 59	4743·910	2·346	4746·256	4746·283	− 0·127	−·682	−·732	+·639
	10	ζ	44 53	4259·930	2·363	4262·293	4262·567	− 0·274	+·706	+·708	−·669
	11	ζ	44 53	4254·289	2·529	4256·818	4256·476	+ 0·342	+·706	+·708	−·694
	12	μ	222 59	4763·169	2·897	4766·066	4765·747	+ 0·319	−·682	−·732	+·720
	13	μ	222 58	4773·788	3·366	4777·154	4776·940	+ 0·214	−·682	−·732	+·763
	14	ζ	44 54	4230·872	3·431	4234·303	4234·392	− 0·089	+·706	+·708	−·782
I_{11}	15	ε	146 29	4336·477	5·234	4341·711	4341·691	+ 0·020	+·552	−·834	+·870
	16	λ	318 57	4892·715	5·756	4898·471	4898·355	+ 0·116	−·657	+·754	−·862
	17	λ	318 52	4892·909	4·996	4897·905	4897·560	+ 0·345	−·658	+·753	−·841
	18	ε	146 43	4342·546	3·720	4346·266	4346·248	+ 0·018	+·549	−·836	+·819
I_{12}	19	κ	244 43	2428·216	0·977	2429·193	2429·401	− 0·208	−·904	−·427	+·510
	20	ζ	46 46	3001·792	1·499	3003·291	3003·597	− 0·306	+·728	+·685	−·641
	21	ζ	46 47	2990·703	1·666	2992·369	2992·712	− 0·343	+·728	+·685	−·686
	22	κ	244 21	2465·293	1·534	2466·827	2467·267	− 0·440	−·901	−·433	+·693
I_{13}	23	γ	118 45	4149·575	4·133	4153·708	4153·667	+ 0·041	+·877	−·481	+·810
	24	λ	302 43	4897·807	4·664	4902·471	4902·316	+ 0·155	−·841	+·541	−·805
	25	λ	302 39	4899·149	4·296	4903·445	4903·184	+ 0·261	−·842	+·540	−·789
	26	γ	119 4	4145·342	2·864	4148·206	4148·101	+ 0·105	+·874	−·486	+·737
II_{14}	27	γ	128 31	4057·053	6·881	4063·934	4064·102	− 0·168	+·782	−·623	+·906
	28	ι	329 43	3373·667	4·947	3378·614	3378·151	+ 0·463	−·504	+·864	−·885
	29	ι	329 36	3371·905	4·267	3376·172	3376·009	+ 0·163	−·506	+·863	−·870
	30	γ	128 55	4058·641	3·984	4062·625	4062·305	+ 0·320	+·778	−·628	+·839
	31	γ	129 3	4058·628	3·418	4062·046	4061·674	+ 0·372	+·776	−·630	+·810
	32	ι	329 10	3365·688	2·779	3368·467	3368·293	+ 0·174	−·513	+·859	−·805
	33	ι	329 4	3364·317	2·570	3366·887	3366·552	+ 0·335	−·514	+·858	−·787
	34	γ	129 19	4058·186	2·671	4060·857	4060·442	+ 0·415	+·774	−·633	+·748

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
II_{15}	35	κ	Sept. 23	P	·63678	16 31 59·77	+16 19 0·81	−3·73	−6·03	+37·55	+13·45
	36	α			·66524	45·11	18 44·70	−4·63	−6·23	37·40	13·95
II_{16}	37	γ	Sept. 24	P	·34608	16 25 49·86	+16 12 14·91	+6·12	−6·87	+37·78	+13·81
	38	γ			·35664	44·29	8·79	+5·94	−6·76	37·78	13·81
	39	ι			·38210	30·84	11 54·05	+5·43	−6·52	37·49	13·80
II_{17}	40	γ	Sept. 26	P	·33758	16 7 45·51	+15 52 25·48	+6·17	−6·95	+38·11	+14·07
	41	η			·34749	39·96	19·38	+6·02	−6·85	37·67	14·28
	42*	η			·35516	35·67	14·67	+5·88	−6·78	37·67	14·28
III_{12}	43	u	Sept. 30	P	·36242	15 28 25·11	+15 8 55·34	+5·49	−6·71	+38·50	+14·87
	44	η			·37585	16·94	46·21	+5·16	−6·59	38·29	14·71
	45	η			·38735	9·93	38·39	+4·85	−6·50	38·29	14·71
	46	u			·40053	1·91	29·42	+4·46	−6·40	38·50	14·88
IV_{14}	47	y	Oct. 3	P	·60250	14 54 53·47	+14 31 1·71	−3·68	−6·35	+38·80	+15·17
	48	x			·61790	43·76	30 50·59	−4·20	−6·44	38·74	15·22
	49	x			·62997	36·15	41·87	−4·57	−6·52	38·74	15·22
	50	y			·64245	28·28	32·85	−4·93	−6·62	38·81	15·17
	51	y			·65717	19·00	22·21	−5·32	−6·73	38·81	15·17
	52	x			·67495	7·78	9·36	−5·72	−6·88	38·75	15·22
	53	x			·68997	53 58·30	29·58·50	−6·01	−7·02	38·75	15·22
	54	y			·70370	49·64	48·57	−6·22	−7·14	38·82	15·18
IV_{15}	58	x	Oct. 4	P	·32008	14 47 20·07	+14 22 20·64	+6·07	−7·06	+38·83	+15·28
	61†				·33684	9·46	8·41	+5·76	−6·91	38·83	15·29
	62	x			·34676	3·19	1·17	+5·55	−6·83	38·83	15·29
	64	x			·35961	46 55·03	21 51·78	+5·24	−6·72	38·83	15·29
	66	x			·37357	46·20	41·58	+4·87	−6·62	38·83	15·29
IV_{16}	70	x	Oct. 4	P	·60599	14 44 18·90	+14 18 51·45	−3·91	−6·42	+38·86	+15·31
	71	x			·61426	13·65	45·39	−4·18	−6·47	38·86	15·31
	74	x			·64866	43 51·75	20·16	−5·18	−6·71	38·87	15·32
	75	x			·66297	42·67	9·64	−5·53	−6·83	38·87	15·32

* No. 42 depends on three pointings, and has been rejected.
† No. 61 rejected. The attempt was made to superpose the images instead of "crossing through."

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
II_{15}	35	κ	233 37	4468·490	2·260	4470·750	4471·172	—0·422	+·805	—·593	+·646
	36	α	43 27	5132·895	3·572	5136·467	5136·364	+0·103	+·688	+·726	—·758
II_{16}‡	37	γ	139 14	4096·086	5·693	4101·779	4101·749	+0·030	+·653	—·758	+·905
	38	γ	139 21	4097·780	4·872	4102·652	4102·718	—0·066	+·651	—·759	+·884
	39	ι	316 22	3215·562	2·922	3218·484	3217·891	+0·593	—·690	+·724	—·831
II_{17}	40	γ	159 6	4592·175	6·018	4598·193	4598·878	—0·685	+·356	—·935	+·861
	41	η	352 47	6396·644	6·997	6403·641	6403·839	—0·198	—·126	+·992	—·753
	42	η	352 45	6392·975	6·328	6399·303	6399·775	(—0·472)	—·126	+·992	—·744
III_{12}	43	u	109 22	4318·163	3·156	4321·319	4321·238	+0·081	+·943	—·332	+·723
	44	η	320 24	4848·639	4·082	4852·721	4853·137	—0·416	—·637	+·771	—·825
	45	η	320 17	4847·473	3·646	4851·119	4851·713	—0·594	—·639	+·769	—·799
	46	u	109 48	4305·676	2·207	4307·883	4307·875	+0·008	+·941	—·339	+·622
IV_{14}	47	y	201 47	1079·492	0·615	1080·107	1080·347	—0·240	—·371	—·929	+·722
	48	x	29 29	657·954	0·421	658·375	658·033	+0·342	+·492	+·871	—·761
	49	x	29 16	646·261	0·453	646·714	646·575	+0·139	+·489	+·873	—·785
	50	y	202 26	1115·602	0·839	1116·441	1116·966	—0·525	—·382	—·924	+·794
	51	y	202 40	1129·121	0·976	1130·097	1130·487	—0·390	—·385	—·923	+·819
	52	x	28 26	603·777	0·668	604·445	603·986	+0·459	+·476	+·880	—·869
	53	x	28 8	589·367	0·801	590·168	589·817	+0·351	+·472	+·882	—·894
	54	y	203 21	1170·085	1·887	1171·972	1173·285	—1·313	—·396	—·918	+·893
IV_{15}	58	x	302 56	113·848	0·155	114·003	114·343	—0·340	—·839	+·544	—·878
	61		295 11	...	...	...	117·727	...	—·905	+·426	...
	62	x	290 50	120·217	0·099	120·316	120·710	—0·394	—·935	+·356	—·746
	64	x	285 32	124·771	0·082	124·853	125·616	—0·763	—·963	+·268	—·669
	66	x	280 16	131·625	0·069	131·694	132·057	—0·363	—·984	+·178	—·582
IV_{16}	70	x	242 30	316·671	0·162	316·833	317·037	—0·204	—·887	—·462	+·633
	71	x	241 59	323·884	0·180	324·064	324·618	—0·554	—·883	—·470	+·662
	74	x	240 2	355·478	0·276	355·754	356·392	—0·638	—·866	—·499	+·769
	75	x	239 19	368·980	0·340	369·320	369·653	—0·333	—·860	—·510	+·809

‡ This group is omitted in the final discussion for parallax, because of delay, dissymmetry and unfavourable conditions, but is included in the discussions up to that point.

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
V_8	77	s	Oct. 12	P	·27345	13 23 37·90	+12 41 9·24	+6·28	−7·33	+39·14	+16·07
	78	m			·28365	31·62	1·21	+6·15	−7·24	39·40	16·25
	79	m			·29256	26·14	40 54·21	+6·03	−7·17	39·40	16·25
	80	s			·30171	20·52	47·01	+5·87	−7·10	39·15	16·07
	81	s			·31088	14·88	39·80	+5·70	−7·02	39·15	16·07
	82	m			·31779	10·63	34·37	+5·56	−6·97	39·41	16·25
	83	m			·32574	5·74	28·12	+5·38	−6·91	39·41	16·25
	84	s			·33779	22 58·20	18·49	+5·08	−6·83	39·15	16·07
VI_{13}	85	v	Oct. 15	P	·55732	12 50 48·89	+11 57 57·83	−3·37	−6·55	+39·53	+16·25
	86	c			·56703	43·24	50·16	−3·70	−6·60	39·06	16·55
	87	c			·57812	36·79	41·40	−4·06	−6·65	39·06	16·55
	88	v			·59067	29·49	31·49	−4·45	−6·72	39·53	16·25
	89	v			·60365	21·95	21·23	−4·81	−6·80	39·53	16·25
	90	c			·61743	13·94	10·34	−5·17	−6·89	39·06	16·55
	91	c			·62615	8·87	3·45	−5·37	−6·94	39·06	16·55
	92	v			·63699	2·58	56 54·88	−5·60	−7·02	39·53	16·25
VI_{14}	93	f	Oct. 16	P	·26052	12 44 2·80	+11 48 42·28	+6·21	−7·31	+39·36	+16·62
	94	r			·27411	43 55·02	31·56	+6·04	−7·21	39·30	16·27
	95	r			·28606	48·17	22·12	+5·85	−7·12	39·31	16·27
	96	f			·29648	42·21	13·90	+5·66	−7·05	39·36	16·62
	97	f			·30497	37·35	7·19	+5·49	−6·98	39·36	16·62
	98	r			·31278	32·89	1·03	+5·32	−6·93	39·31	16·27
	99	r			·32120	28·07	47 54·38	+5·12	−6·88	39·31	16·27
	100	f			·32799	24·19	49·01	+4·95	−6·83	39·36	16·62
VI_{15}	101	v	Oct. 16	P	·55244	12 41 16·13	+11 44 51·83	−3·30	−6·55	+39·58	+16·31
	102	c			·57135	5·37	36·91	−3·94	−6·64	39·09	16·60
	103	c			·58092	40 59·93	29·35	−4·24	−6·69	39·09	16·60
	104	v			·59230	53·45	20·37	−4·57	−6·75	39·58	16·31
	105	v			·60339	47·14	11·61	−4·88	−6·82	39·58	16·31
	106	c			·61606	39·94	1·62	−5·20	−6·90	39·10	16·61
	107	h	Oct. 18	P	·56316	12 22 41·03	+11 18 29·26	−3·85	−6·64	+39·19	+16·56
VII_{12}	108	c	Oct. 23	P	·27346	11 43 39·60	+10 17 53·45	+5·52	−6·99	+39·22	+16·90
	109*										
	110	n			·28896	32·61	41·73	+5·20	−6·90	39·28	16·57

* For 109 two fixed stars have been observed instead of one comparison star and *Sappho*.

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f′	f″	f‴
			° ′	″	″	″	″	″			
	77	s	340 13	5210·797	11·990	5222·787	5223·456	− 0·669	−·338	+·941	−·897
	78	m	156 39	5862·646	10·023	5872·669	5873·441	− 0·772	+·396	−·918	+·902
	79	m	156 43	5868·176	8·639	5876·815	5877·653	− 0·838	+·395	−·919	+·892
V_8	80	s	339 57	5201·375	7·210	5208·585	5208·707	− 0·122	−·343	+·939	−·863
	81	s	339 52	5197·798	6·327	5204·125	5203·964	+ 0·161	−·344	+·939	−·850
	82	m	156 56	5883·041	6·110	5889·151	5889·597	− 0·446	+·392	−·920	+·854
	83	m	157 0	5887·388	5·579	5892·967	5893·369	− 0·402	+·391	−·921	+·842
	84	s	339 36	5185·693	4·642	5190·335	5190·017	+ 0·318	−·349	+·937	−·813
	85	v	251 13	5508·879	2·432	5511·311	5512·119	− 0·808	−·947	−·321	+·522
	86	c	66 42	6646·294	3·482	6649·776	6650·921	− 1·145	+·919	+·396	−·594
	87	c	66 44	6636·679	3·808	6640·487	6641·335	− 0·848	+·919	+·395	−·628
	88	v	251 1	5536·235	3·175	5539·410	5539·709	− 0·299	−·946	−·325	+·630
VI_{13}	89	v	250 57	5545·776	3·602	5549·378	5550·403	− 1·025	−·945	−·326	+·666
	90	c	66 55	6601·509	5·681	6607·190	6607·528	− 0·338	+·920	+·392	−·735
	91	c	66 57	6593·638	6·343	6599·981	6600·082	− 0·101	+·921	+·392	−·756
	92	v	250 45	5571·692	5·388	5577·080	5577·801	− 0·721	−·944	−·330	+·749
	93	f	140 12	5797·885	14·000	5811·885	5811·632	+ 0·253	+·640	−·768	+·950
	94	r	317 37	5928·299	12·549	5940·848	5941·281	− 0·433	−·674	+·739	−·932
	95	r	317 31	5928·708	10·068	5938·776	5939·054	− 0·278	−·675	+·738	−·912
VI_{14}	96	f	140 32	5812·574	7·516	5820·090	5820·152	− 0·062	+·636	−·772	+·897
	97	f	140 37	5815·183	6·692	5821·875	5822·171	− 0·296	+·634	−·773	+·880
	98	r	317 16	5927·220	6·759	5933·979	5934·196	− 0·217	−·679	+·735	−·863
	99	r	317 11	5926·662	6·081	5932·743	5932·706	+ 0·037	−·680	+·734	−·846
	100	f	140 50	5822·448	5·120	5827·568	5827·683	− 0·115	+·631	−·775	+·835
	101	v	246 6	6319·419	2·925	6322·344	6322·580	− 0·236	−·914	−·405	+·560
	102	c	71 39	5837·800	3·041	5840·841	5840·820	+ 0·021	+·949	+·315	−·575
	103	c	71 43	5829·708	3·294	5833·002	5833·191	− 0·189	+·950	+·314	−·604
VI_{15}	104	v	245 56	6352·596	4·073	6356·669	6356·933	− 0·264	−·913	−·408	+·684
	105	v	245 53	6361·130	4·564	6365·694	6366·472	− 0·778	−·913	−·409	+·715
	106	c	71 54	5800·472	4·735	5805·207	5804·953	+ 0·254	+·951	+·311	−·698
	107	h	23 58	3076·694	2·093	3078·787	3079·506	− 0·719	+·407	+·914	−·761
	108	c	147 3	4005·210	5·673	4010·883	4011·057	− 0·174	+·544	−·839	+·881
VII_{12}	109										
	110	n	310 43	4815·047	5·729	4820·776	4821·062	− 0·286	−·758	+·652	−·837

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	111	h	Oct. 23	P	·55100	11 41 35·34	+10 14 23·96	−3·86	−6·64	+39·29	+16·75
VII_{13}	112	g	Oct. 24	P	·26264	11 36 24·34	+10 5 29·85	+5·62	−7·02	+39·12	+16·67
	113	c			·27685	18·24	19·24	+5·36	−6·94	39·22	16·94
	114	c			·28526	14·63	12·95	+5·19	−6·89	39·22	16·94
	115	g			·29850	8·96	3·06	+4·88	−6·81	39·12	16·67
	116	g			·31040	3·86	4 54·18	+4·58	−6·75	39·12	16·67
	117	c			·31855	0·38	48·09	+4·36	−6·71	39·22	16·94
VII_{14}	119	a	Oct. 26	P	·54799	11 21 3·83	+ 9 37 27·66	−3·98	−6·64	+38·87	+16·75
	120	h			·56085	20 59·00	18·35	−4·35	−6·69	39·29	16·85
	121	h			·57392	54·09	8·89	−4·69	−6·75	39·29	16·85
VII_{15}	122	g	Oct. 27	P	·28775	11 16 32·67	+ 9 28 35·20	+4·84	−6·78	+39·12	+16·73
	123	b			·30230	27·48	24·79	+4·48	−6·71	38·97	16·89
	124	b			·31133	24·26	18·33	+4·24	−6·66	38·97	16·89
	125	g			·32170	20·55	10·91	+3·94	−6·62	39·12	16·73

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
	111	h	228 39	1560·199	1·038	1561·237	1561·450	− 0·213	−·751	−·661	+·723
VII_{13}	112	g	350 10	3223·967	4·627	3228·594	3228·531	+ 0·063	−·171	+·985	−·786
	113	c	157 0	4469·396	5·595	4474·991	4475·692	− 0·701	+·391	−·921	+·846
	114	c	157 5	4475·025	5·025	4480·050	4479·991	+ 0·059	+·390	−·921	+·834
	115	g	349 49	3201·951	2·962	3204·913	3205·117	− 0·204	−·177	+·984	−·755
	116	g	349 41	3195·036	2·644	3197·680	3197·386	+ 0·294	−·179	+·984	−·745
	117	c	157 22	4493·164	3·590	4496·754	4497·016	− 0·262	+·385	−·923	+·784
VII_{14}	119	a	35 53	4448·331	3·669	4452·000	4451·938	+ 0·062	+·586	+·810	−·768
	120	h	216 17	4037·136	3·536	4040·672	4040·710	− 0·038	−·592	−·806	+·792
	121	h	216 16	4046·272	4·056	4050·328	4051·448	− 1·120	−·592	−·806	+·818
VII_{15}	122	g	299 13	1978·519	1·909	1980·428	1980·240	+ 0·188	−·873	+·488	−·748
	123	b	106 32	2351·037	1·552	2352·589	2353·004	− 0·415	+·958	−·284	+·614
	124	b	106 43	2350·073	1·419	2351·492	2351·575	− 0·083	+·957	−·288	+·592
	125	g	298 26	1978·599	1·304	1979·903	1979·878	+ 0·025	−·879	+·476	−·656

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TABLE D.—GÖTTINGEN DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
I_{14}	1	ε	Sept. 18	An	·40159	17 12 14·73	+17 3 48·52	+5·45	−6·38	+36·72	+12·79
	2	ε			·41324	10·03	43·16	+5·19	−6·27	36·72	12·79
	3	λ			·42841	3·92	36·18	+4·80	−6·14	36·27	12·89
	4	λ			·43576	0·96	32·80	+4·60	−6·08	36·28	12·89
I_{15}	5	μ	Sept. 18	An	·68328	17 10 20·32	+17 1 38·22	−4·43	−6·04	+36·65	+12·54
	6	μ			·69469	15·68	32·95	−4·75	−6·13	36·65	12·54
	7	ζ			·71008	9·34	25·74	−5·15	−6·27	36·54	13·07
II_{17}	8	γ	Sept. 23	An	·39692	16 34 2·78	+16 21 15·91	+5·28	−6·47	+37·61	+13·69
	9	γ			·40692	33 57·66	10·29	+5·03	−6·38	37·61	13·69
	10	ι			·42293	49·49	1·31	+4·59	−6·25	37·31	13·68
	11	ι			·43482	43·41	20 54·64	+4·23	−6·16	37·31	13·68
III_{13}	12	u	Sept. 30	An	·40904	15 27 56·72	+15 8 23·64	+4·38	−6·42	+38·50	+14·88
	13	u			·41786	51·35	17·64	+4·11	−6·36	38·50	14·88
	14	η			·43397	41·54	6·66	+3·57	−6·26	38·30	14·72
	15	η			·44655	33·88	7 58·10	+3·12	−6·20	38·30	14·72
IV_{17}	20	x	Oct. 3	S	·62032	14 54 42·24	+14 30 48·85	−4·04	−6·44	+38·74	+15·22
IV_{18}	21	x	Oct. 4	S	·36213	14 46 53·44	+14 21 49·94	+5·33	−6·79	+38·83	+15·29
	24	x			·40702	25·01	17·12	+4·04	−6·47	38·84	15·29
IV_{19}	26	x	Oct. 4	S	·62377	14 44 7·62	+14 18 38·41	−4·25	−6·51	+38·86	+15·31
	28	x			·66757	43 39·76	6·28	−5·45	−6·83	38·87	15·32
IV_{20}	33	x	Oct. 6	S	·62092	14 22 57·29	+13 53 53·70	−4·35	−6·58	+39·08	+15·50
	34	t			·63344	49·32	44·27	−4·73	−6·66	38·97	15·60
	35	t			·64503	41·94	35·55	−5·05	−6·75	38·97	15·60
	36	x			·66208	31·07	22·71	−5·47	−6·88	39·09	15·51
V_9	37	w	Oct. 12	S	·69606	13 19 18·74	+12 35 36·75	−6·28	−7·38	+39·47	+16·05
	38	i			·70979	10·35	25·94	−6·40	−7·49	39·16	16·29
VI_{16}	39	f	Oct. 15	S	·34216	12 52 54·38	+12 0 47·90	+4·83	−6·83	+39·32	+16·56
	40	s			·35696	45·73	36·19	+4·41	−6·74	39·34	16·25
	41	s			·37621	34·49	20·98	+3·81	−6·64	39·34	16·25
	42	f			·39440	23·86	6·60	+3·19	−6·56	39·32	16·56

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f	f'	f''
			° ′	″	″	″	″	″			
I_{14}	1	ε	129 57	4162·456	3·747	4166·203	4166·403	− 0·200	+·767	−·642	+·810
	2	ε	130 2	4162·420	3·305	4165·725	4166·166	− 0·441	+·766	−·643	+·783
	3	λ	332 26	5220·119	3·849	5223·968	5223·882	+ 0·086	−·463	+·887	−·757
	4	λ	332 23	5218·746	3·626	5222·372	5222·355	+ 0·017	−·464	+·886	−·743
I_{15}	5	μ	223 0	4769·340	3·008	4772·348	4772·414	− 0·066	−·682	−·731	+·731
	6	μ	223 0	4776·376	3·308	4779·684	4779·569	+ 0·115	−·682	−·731	+·758
	7	ζ	44 53	4223·920	3·571	4227·491	4227·903	− 0·412	+·706	+·708	−·791
II_{17}	8	γ	129 8	4057·940	3·279	4061·219	4061·300	− 0·081	+·776	−·631	+·801
	9	γ	129 14	4057·805	2·965	4060·770	4060·821	− 0·051	+·774	−·632	+·777
	10	ι	328 52	3360·202	2·303	3362·505	3362·379	+ 0·126	−·517	+·856	−·763
	11	ι	328 43	3358·554	2·102	3360·656	3359·968	+ 0·688	−·519	+·855	−·738
III_{13}	12	u	109 52	4302·943	2·172	4305·115	4305·077	+ 0·038	+·941	−·340	+·616
	13	u	109 58	4299·591	2·034	4301·625	4301·998	− 0·373	+·940	−·342	+·591
	14	η	319 49	4843·342	2·663	4846·005	4846·053	− 0·048	−·645	+·764	−·700
	15	η	319 40	4841·745	2·462	4844·207	4844·653	− 0·446	−·647	+·762	−·668
IV_{17}	20	x	29 15	654·585	0·403	654·988	655·867	− 0·879	+·489	+·873	−·753
IV_{18}	21	x	285 7	126·806	0·083	126·889	126·523	+ 0·366	− ·965	+ ·261	−·675
	24	x	269 59	151·368	0·054	151·422	151·289	+ 0·133	−1·000	−0·000	−·392
IV_{19}	26	x	241 41	332·881	0·187	333·068	333·154	− 0·086	− ·880	− ·474	+·671
	28	x	239 24	373·809	0·335	374·144	373·733	+ 0·411	− ·861	− ·509	+·803
IV_{20}	33	x	222 54	2241·152	1·485	2242·637	2242·757	− 0·120	− ·681	− ·733	+·770
	34	t	37 37	1067·434	0·814	1068·248	1067·859	+ 0·389	+ ·611	+ ·792	−·808
	35	t	37 35	1055·466	0·900	1056·366	1056·320	+ 0·046	+ ·610	+ ·792	−·834
	36	x	222 52	2282·058	2·285	2284·343	2283·753	+ 0·590	− ·680	− ·733	+·865
V_{9}	37	w	237 4	4976·991	11·319	4988·310	4987·983	+ 0·327	− ·839	− ·544	+·915
	38	i	71 0	3733·060	10·820	3743·880	3744·058	− 0·178	+ ·946	+ ·326	−·835
VI_{16}	39	f	131 25	5644·509	4·588	5649·097	5650·063	− 0·966	+ ·750	− ·661	+·806
	40	s	304 43	4358·122	3·095	4361·217	4361·766	− 0·549	− ·822	+ ·570	−·738
	41	s	304 28	4358·900	2·611	4361·511	4362·765	− 1·254	− ·824	+ ·566	−·683
	42	f	131 56	5650·118	3·007	5653·125	5653·998	− 0·873	+ ·744	− ·668	+·670

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
VI_{17}	43	v	Oct. 15	S	·55331	12 50 51·23	+11 58 1·00	−2·98	−6·53	+39·52	+16·25
	44	c			·56703	43·24	57 50·16	−3·46	−6·59	39·06	16·55
	45	c			·58409	33·31	36·68	−4·02	−6·67	39·06	16·55
	46	v			·60000	24·07	24·11	−4·50	−6·76	39·53	16·25
VI_{18}	47	f	Oct. 16	S	·34476	12 43 14·59	+11 47 35·77	+4·65	−6·80	+39·36	+16·62
	48	r			·35982	5·98	23·89	+4·21	−6·72	39·31	16·27
	49	r			·37926	42 54·87	8·53	+3·59	−6·62	39·31	16·28
	50	f			·39252	47·30	46 58·06	+3·14	−6·56	39·36	16·63
VI_{19}	51	v	Oct. 16	S	·59598	12 40 51·36	+11 44 17·46	−4·46	−6·76	+39·58	+16·31
	52	c			·61231	42·08	4·58	−4·91	−6·85	39·10	16·61
	53	c			·62339	35·79	43 55·84	−5·18	−6·92	39·10	16·61
	53*	v			·64134	25·59	41·67	−5·57	−7·05	39·58	16·31
VII_{16}	54	o	Oct. 19	S	·56348	12 13 49·86	+11 5 26·86	−3·74	−6·66	+39·47	+16·60
	55	d			·58560	38·32	9·61	−4·41	−6·76	39·05	16·63
	56	d			·59856	31·55	4 59·49	−4·77	−6·83	39·05	16·63
	57	o			·62122	19·72	41·82	−5·31	−6·97	39·48	16·60
VII_{17}	58	o	Oct. 21	S	·51606	11 57 23·83	+10 40 13·89	−2·25	−6·51	+39·52	+16·69
	59	d			·53686	13·71	39 57·91	−2·99	−6·57	39·08	16·70
	60	d			·55488	4·95	44·04	−3·60	−6·64	39·08	16·70
	61	o			·57363	56 55·84	29·62	−4·18	−6·72	39·52	16·69
VII_{18}	62	d	Oct. 26	S	·34634	11 22 20·09	+ 9 39 53·89	+3·49	−6·61	+39·09	+16·84
	63	g			·36738	12·09	38·62	+2·80	−6·54	39·12	16·71
	64	g			·37970	7·41	29·67	+2·36	−6·50	39·12	16·71
	65	d			·39666	0·96	17·36	+1·75	−6·47	39·09	16·84
VII_{19}	66	b	Oct. 27	S	·38678	11 15 57·41	+ 9 27 24·40	+1·99	−6·47	+38·96	+16·89
	67	g			·40295	51·67	12·85	+1·39	−6·44	39·12	16·73

* The clock-error in this group is uncertain, as the electric dial, worked by a current sent every second from the sidereal clock, appears to have tripped. The observation is not used.

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Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
VI_{17}	43	v	251 15	5505·631	2·271	5507·902	5508·555	− 0·653	−·947	−·321	+·486
	44	c	66 41	6646·955	3·310	6650·265	6651·141	− 0·876	+·919	+·396	−·572
	45	c	66 45	6631·646	3·782	6635·428	6636·377	− 0·949	+·919	+·395	−·624
	46	v	250 59	5543·091	3·258	5546·349	5547·204	− 0·855	−·945	−·326	+·636
VI_{18}	47	f	140 58	5826·636	4·621	5831·257	5831·850	− 0·593	+·629	−·777	+·814
	48	r	316 51	5920·752	4·343	5925·095	5925·942	− 0·847	−·684	+·730	−·773
	49	r	316 40	5918·245	3·705	5921·950	5922·711	− 0·761	−·686	+·727	−·722
	50	f	141 25	5839·673	3·226	5842·899	5843·493	− 0·594	+·624	−·781	+·704
VI_{19}	51	v	245 56	6354·729	3·896	6358·625	6359·889	− 1·264	−·913	−·408	+·675
	52	c	71 52	5803·439	4·114	5807·553	5808·130	− 0·577	+·950	+·311	−·670
	53	c	71 56	5793·776	4·671	5798·447	5799·311	− 0·864	+·951	+·310	−·697
	53*	v	245 43	6391·216	6·608	6397·824	6398·759	− 0·935	−·912	−·411	+·786
VII_{16}†	54	o	221 22	3569·001	2·267	3571·268	3571·949	− 0·681	−·661	−·751	+·743
	55	d	38 15	5829·642	4·789	5834·431	5833·096	+ 1·335	+·619	+·785	−·799
	56	d	38 15	5816·821	5·455	5822·276	5820·763	+ 1·513	+·619	+·785	−·826
	57	o	221 16	3621·987	4·122	3626·109	3626·572	− 0·463	−·660	−·752	+·868
VII_{17}	58	o	218 26	5350·557	2·652	5353·209	5353·796	− 0·587	−·622	−·783	+·648
	59	d	40 46	4051·388	2·336	4053·724	4054·373	− 0·649	+·653	+·758	−·690
	60	d	40 47	4034·374	2·648	4037·022	4037·810	− 0·788	+·653	+·757	−·734
	61	o	218 23	5402·141	3·959	5406·100	5406·931	− 0·831	−·621	−·784	+·782
VII_{18}	62	d	131 47	798·846	0·520	799·366	799·962	− 0·596	+·745	−·666	+·696
	63	g	319 29	2144·167	1·280	2145·447	2145·713	− 0·266	−·650	+·760	−·677
	64	g	319 14	2140·565	1·184	2141·749	2142·238	− 0·489	−·653	+·757	−·644
	65	d	134 43	808·291	0·389	808·680	809·994	− 1·314	+·711	−·703	+·578
VII_{19}	66	b	108 9	2338·288	0·872	2339·160	2340·357	− 1·197	+·950	−·312	+·388
	67	g	296 33	1979·375	0·760	1980·135	1980·718	− 0·583	−·895	+·447	−·411

† Clock-error uncertain.

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TABLE E.—BAMBERG DISTANCES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
IV_{21}	1 & 2	x	Oct. 3	Hg.	·61049	14 54 48·43	+14 30 55·94	−3·93	−6·17	+38·74	+15·22
	3 & 4	y			·62636	38·43	44·48	−4·47	−6·27	38·81	15·17
	5 & 6	y			·64652	25·72	29·91	−5·09	−6·42	38·81	15·17
	7 & 8	x			·66338	15·08	17·72	−5·54	−6·56	38·75	15·22
IV_{22}	11 & 12	x	Oct. 4	Hg.	·66064	14 43 44·15	+14 18 11·36	−5·55	−6·59	+38·87	+15·32
	13 & 14	x			·67510	34·98	0·75	−5·88	−6·71	38·87	15·32
VII_{20}	17 & 18	o	Oct. 19	Hg.	·59230	12 13 34·82	+11 5 4·38	−4·81	−6·60	+39·47	+16·60
	19 & 20	d			·60792	26·66	4 52·19	−5·22	−6·69	39·05	16·63
	21 & 22	d			·62238	19·11	4 40·91	−5·56	−6·79	39·05	16·63
	23 & 24	o			·63767	11·14	28·99	−5·87	−6·89	39·48	16·61

TABLE F.—CAPE POSITION-ANGLES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
IV_{23}	78	x	Oct. 4	G.	·36760	14 46 49·98	+14 21 45·94	+6·04	+7·01	+38·83	+15·29
	79	x			·37360	46·18	41·56	+5·80	+7·06	38·83	15·29
	80	x			·38471	39·15	33·43	+5·33	+7·16	38·83	15·29
	81	x			·39374	33·42	26·83	+4·92	+7·23	38·84	15·29
IV_{24}	84	x	Oct. 4	G	·58344	14 44 33·19	+14 19 7·97	−4·93	+7·23	+38·86	+15·31
	85	x			·59033	28·83	2·92	−5·24	+7·17	38·86	15·31
	86	x			·60107	22·02	18 55·05	−5·70	+7·09	38·86	15·31
	87	x			·61051	16·03	48·13	−6·09	+7·00	38·86	15·31
VII_{21}	161	d	Oct. 25	G.	·35556	11 28 48·86	+ 9 51 58·74	+3·34	+6·58	+39·09	+16·81
	162	d			·36184	46·33	54·11	+3·04	+6·60	39·09	16·81

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Position-Angle.	Instrumental Distance.	Refraction.	Observed Distance.	Tabular Distance.	O–C.	f'	f''	f'''
			° ′	″	″	″	″	″			
IV_{21}	1 & 2	x	29 36	665·517	0·370	665·887	665·281	+ 0·606	+·494	+·870	—·725
	3 & 4	y	202 11	1101·137	0·165	1101·302	1101·986	— 0·684	—·378	—·926	+·745
	5 & 6	y	202 31	1119·540	0·158	1119·698	1120·503	— 0·805	—·383	—·924	+·782
	7 & 8	x	28 38	614·661	0·532	615·193	615·072	+ 0·121	+·479	+·878	—·833
IV_{22}	11 & 12	x	239 28	366·686	0·301	366·987	367·437	— 0·450	—·861	—·508	+·798
	13 & 14	x	238 47	379·935	0·377	380·312	380·845	— 0·533	—·855	—·518	+·835
VII_{20}	17 & 18	o	221 17	3596·670	2·857	3599·527	3599·229	+ 0·298	—·660	—·751	+·808
	19 & 20	d	38 17	5808·592	5·899	5814·491	5813·765	+ 0·726	+·620	+·785	—·843
	21 & 22	d	38 17	5793·571	7·127	5800·698	5800·027	+ 0·671	+·620	+·785	—·871
	23 & 24	o	221 12	3637·197	5·166	3642·363	3642·077	+ 0·286	—·659	—·752	+·898

OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	fp'	fp''	fp'''
			″	′ ″	″	° ′ ″	′ ″	′ ″	″			
IV_{23}	78	x	132	23 58	— 60	288 22 58	21 31	+ 1 27	+0·055	+·315	+·949	+·849
	79	x	134	7 16	— 56	286 6 20	4 45	+ 1 35	+0·061	+·277	+·961	+·834
	80	x	139	18 22	— 48	282 17 34	4 40	+12 54	+0·521	+·211	+·977	+·809
	81	x	144	8 7	— 43	279 7 24	2 28	+ 4 56	+0·207	+·158	+·987	+·789
IV_{24}	84	x	292	36 16	+ 12	246 36 28	34 44	+ 1 44	+0·149	—·397	+·918	+·854
	85	x	299	2 50	+ 17	246 3 7	1 28	+ 1 39	+0·144	—·406	+·914	+·861
	86	x	308	17 28	+ 27	245 17 55	12 23	+ 5 32	+0·496	—·419	+·908	+·875
	87	x	317	34 1	+ 38	244 34 39	31 29	+ 3 10	+0·294	—·430	+·903	+·886
VII_{21}	161	d	999	12 59	— 32	78 12 27	13 56	— 1 29	—0·436	+·204	—·979	—·577
	162	d	995	25 49	— 29	78 25 20	27 33	— 2 13	—0·646	+·201	—·980	—·587

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TABLE G.—YALE POSITION-ANGLES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	138	x	Oct. 3	H	·57230	14 55 12·53	+14 31 23·51	+7·02	−5·59	+38·74	+15·21
	140	y*			·58370	55 5·34	15·28	+6·74	−5·47	38·75	15·19
IV$_{25}$	142	y*			·59650	54 57·26	6·04	+6·38	−5·34	38·75	15·19
	144	x			·61607	44·92	30 51·91	+5·75	−5·16	38·74	15·22
	146	x			·63271	34·43	39·89	+5·15	−5·03	38·74	15·22
	148	x	Oct. 3	E	·86596	14 52 7·22	+14 27 51·06	−5·48	−5·11	+38·77	+15·24
	150	y*			·87322	2·64	45·80	−5·74	−5·17	38·78	15·22
IV$_{26}$	152	y*			·88069	51 57·92	40·39	−5·99	−5·23	38·79	15·22
	154	x			·88812	53·23	34·99	−6·23	−5·30	38·78	15·24
	160	x	Oct. 4	E	·57995	14 44 35·41	+14 19 10·53	+6·75	−5·50	+38·86	+15·31
	162	x			·58643	31·30	5·78	+6·57	−5·44	38·86	15·31
IV$_{27}$	164	x			·59338	26·89	0·69	+6·37	−5·37	38·86	15·31
	170	x			·61217	14·98	18 46·92	+5·77	−5·20	38·86	15·31
	172	x			·61900	10·65	41·91	+5·53	−5·14	38·86	15·31
	174	x	Oct. 4	H	·86919	14 41 31·91	+14 15 38·10	−5·71	−5·19	+38·89	+15·34
	176	x			·87955	25·34	30·47	−6·05	−5·28	38·89	15·34
	178	x			·88955	18·99	23·11	−6·36	−5·37	38·89	15·34
	180	x			·89227	17·26	21·11	−6·45	−5·40	38·89	15·34
IV$_{28}$	182	x			·90217	10·97	13·82	−6·72	−5·50	38·89	15·34
	184	x			·90485	9·27	11·85	−6·79	−5·52	38·89	15·34
	190	x			·93370	40 50·95	14 50·61	−7·42	−5·83	38·90	15·34
	192	x			·93702	48·84	48·16	−7·47	−5·87	38·90	15·34
	194	x	Oct. 5	H	·56239	14 34 11·34	+14 7 5·46	+7·09	−5·67	+38·97	+15·40
	196	t			·57004	6·48	6 59·78	+6·91	−5·59	38·86	15·51
	198	t			·57491	3·38	56·16	+6·79	−5·54	38·86	15·51
	200	x			·58053	33 59·81	51·99	+6·64	−5·48	38·97	15·40
IV$_{29}$	202	x			·58610	56·26	47·84	+6·49	−5·43	38·97	15·41
	204	t			·59411	51·16	41·89	+6·25	−5·35	38·86	15·51
	206	t			·60008	47·36	37·45	+6·06	−5·30	38·86	15·51
	208	x			·60750	42·63	31·93	+5·82	−5·23	38·97	15·41
	210	x			·61263	39·37	28·12	+5·64	−5·19	38·97	15·41

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	fp'	fp''	fp'''
			″	′ ″	″	° ′ ″	′ ″	′ ″	″			
	138	x	707	48 27	− 9	30 48 18	52 16	−3 58	−0·816	+·859	−·512	+·870
	140	y*	534	22 35	− 26	329 22 9	18 22	+3 47	+0·588	+·860	+·510	+·282
IV_{25}	142	y*	530	9 43	− 15	328 9 28	2 40	+6 48	+1·048	+·849	+·528	+·242
	144	x	666	15 25	− 5	30 15 20	10 57	+4 23	+0·849	+·864	−·503	+·741
	146	x	650	51 13	− 5	29 51 8	53 28	−2 20	−0·441	+·867	−·498	+·682
	148	x	430	23 59	+ 12	23 24 11	26 10	−1 59	−0·248	+·918	−·397	−·284
	150	y*	525	26 31	− 32	298 25 59	25 58	+0 7	+0·003	+·476	+·880	−·720
IV_{26}	152	y*	527	40 30	− 37	297 39 53	39 36	+0 17	+0·043	+·464	+·886	−·732
	154	x	410	29 57	+ 25	22 30 22	30 26	−0 4	−0·008	+·924	−·383	−·354
	160	x	285	33 30	+ 66	243 34 36	37 13	−2 37	−0·217	−·445	+·895	−·783
	162	x	290	12 44	+ 56	243 13 40	9 20	+4 20	+0·365	−·451	+·893	−·773
IV_{27}	164	x	297	42 9	+ 50	242 42 59	40 48	+2 11	+0·189	−·459	+·889	−·760
	170	x	314	25 23	+ 34	241 25 57	29 21	−3 24	−0·311	−·478	+·878	−·724
	172	x	320	8 6	+ 29	241 8 35	5 20	+3 15	+0·303	−·483	+·875	−·709
	174	x	559	44 18	− 18	232 44 0	43 30	+0 30	+0·081	−·606	+·796	−·078
	176	x	569	29 1	− 19	232 28 42	30 53	−2 11	−0·361	−·608	+·793	−·063
	178	x	579	17 1	− 20	232 16 41	19 6	−2 25				
	180	x	581	8 46	− 20	232 8 26	15 59	−7 33	−0·840	−·613	+·790	−·045
IV_{28}	182	x	591	59 22	− 21	231 59 1	64 37	−5 36				
	184	x	593	60 0	− 21	231 59 39	61 40	−2 1	−0·656	−·616	+·788	−·031
	190	x	621	24 58	− 25	231 24 33	30 12	−5 39				
	192	x	624	21 42	− 25	231 21 17	26 39	−5 22	−0·998	−·624	+·781	−·006
	194	x	1210	13 53	+ 36	225 14 29	15 57	−1 28	−0·516	−·704	+·710	−·887
	196	t	2107	50 48	+ 12	38 51 0	51 29	−0 29	−0·296	+·779	−·627	+·872
	198	t	2103	50 52	+ 11	38 51 3	51 10	−0 7	−0·071	+·779	−·627	+·860
	200	x	1228	11 14	+ 25	225 11 39	12 26	−0 47	−0·280	−·705	+·710	−·843
IV_{29}	202	x	1233	9 45	+ 21	225 10 6	11 21	−1 15	−0·448	−·705	+·710	−·830
	204	t	2084	48 57	+ 7	38 49 4	49 50	−0 46	−0·465	+·779	−·627	+·807
	206	t	2078	47 9	+ 6	38 47 15	49 24	−2 9	−1·299	+·780	−·626	+·790
	208	x	1254	4 49	+ 14	225 5 3	7 36	−2 33	−0·930	−·706	+·708	−·769
	210	x	1259	4 40	+ 12	225 4 52	6 44	−1 52	−0·684	−·706	+·708	−·753

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Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	212	t	Oct. 7	H	·64809	14 12 3·16	+13 40 56·06	+3·98	−4·94	+39·06	+15·69
	214	t			·65086	1·39	53·95	+3·87	−4·93	39·06	15·69
IV_{30}	216	t			·65811	11 56·77	48·43	+3·55	−4·89	39·06	15·69
	218	t			·65261	53·91	45·01	+3·34	−4·87	39·06	15·69
	220	t			·66829	50·29	40·69	+3·08	−4·84	39·07	15·69
	221	t	Oct. 7	E	·84567	14 9 57·45	+13 38 25·51	−5·19	−5·15	+39·08	+15·71
	222	t			·85015	54·60	22·09	−5·36	−5·18	39·08	15·71
	224	t			·85301	52·78	19·91	−5·46	−5·21	39·08	15·71
IV_{31}	225	t			·85792	49·66	16·16	−5·63	−5·24	39·08	15·71
	226	t			·86129	47·51	13·59	−5·75	−5·27	39·08	15·71
	227	t			·86669	44·08	9·47	−5·93	−5·32	39·08	15·71

TABLE H.—LEIPZIG POSITION-ANGLES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
	59	x	Oct. 4	P	·32740	14 47 15·44	+14 22 15·31	+5·94	−7·00	+38·83	+15·29
	60	x			·33635	9·77	8·77	+5·77	−6·92	38·83	15·29
IV_{32}	63	x			·35374	46 58·75	21 56·06	+5·39	−6·77	38·83	15·29
	65	x			·36582	51·11	47·24	+5·08	−6·68	38·83	15·29
	67	x			·37938	42·52	37·33	+4·71	−6·58	38·83	15·29
	68	x	Oct. 4	P	·59187	14 44 27·86	+14 19 1·80	−3·42	−6·34	+38·86	+15·31
	69	x			·59858	23·59	18 56·88	−3·66	−6·37	38·86	15·31
IV_{33}	72	x			·62740	5·32	35·75	−4·59	−6·55	38·86	15·31
	73	x			·63761	43 58·75	28·26	−4·89	−6·63	38·87	15·32

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Set.	Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	fp'	fp''	fp'''
			″	′ ″	″	° ′ ″	′ ″	′ ″	″			
IV_{30}	212	t	85	58 51	− 8	23 58 43	55 35	+ 3 8	+0·077	+·914	−·406	+·555
	214	t	82	83 56	− 8	23 83 48	21 29	+62 19	+1·487	+·918	−·396	+·540
	216	t	76	57 42	− 9	21 57 33	39 51	+17 42	+0·391	+·929	−·310	+·502
	218	t	71	15 34	− 9	20 15 25	26 43	−11 18	−0·233	+·938	−·349	+·475
	220	t	66	83 49	− 9	18 83 39	40 47	+42 52	+0·823	+·947	−·320	+·438
IV_{31}	221	t	121	17 5	−17	232 16 48	55 22	−38 34	−1·358	−·603	+·798	−·107
	222	t	125	28 14	−17	231 27 56	88 26	−60 30	−2·164	−·609	+·793	−·094
	224	t	128	56 49	−17	231 56 32	71 55	−15 23	−0·573	−·613	+·790	−·086
	225	t	133	52 15	−17	230 51 58	105 24	−53 26	−2·067	−·619	+·785	−·072
	226	t	136	19 45	−17	231 19 28	28 22	− 8 54	−0·352	−·623	+·782	−·064
	227	t	142	9 0	−17	231 8 44	2 16	+ 6 28	+0·267	−·629	+·777	−·051

OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	fp'	fp''	fp'''
			″	′ ″	″	° ′ ″	° ′ ″	′ ″	″			
IV_{32}	59	x	116	33 39	+90	299 35 9	299 29 40	+ 5 29	+0·185	+·493	+·871	−·326
	60	x	118	20 40	+88	295 22 8	295 23 39	− 1 31	−0·052	+·429	+·903	−·385
	63	x	123	50 15	+77	287 51 32	287 53 44	− 2 12	−0·079	+·307	+·952	−·485
	65	x	128	14 42	+68	283 15 50	283 7 28	+ 8 22	+0·312	+·228	+·974	−·539
	67	x	135	16 58	+57	278 17 55	278 13 44	+ 4 11	+0·164	+·144	+·990	−·584
IV_{33}	68	x	304	25 41	−33	243 25 8	243 26 33	− 1 25	−0·125	−·447	+·894	−·419
	69	x	310	2 13	−36	243 1 37	242 59 8	+ 2 29	+0·224	−·454	+·891	−·407
	72	x	337	8 55	−46	241 8 9	241 11 34	− 3 25	−0·335	−·482	+·876	−·360
	73	x	346	38 18	−51	240 37 27	240 37 31	− 0 4	−0·007	−·491	+·871	−·344

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TABLE I.—GÖTTINGEN POSITION-ANGLES, COMPARISON

Set.	Rotation No.	Star.	Date. — Definition.	Observer.	Fraction of Day, B.M.T.	Tabular Geocentric R.A.	Tabular Geocentric Declination.	Parallax.		Star Correction.	
								α	δ	α	δ
			1889.			° ′ ″	° ′ ″	″	″	″	″
IV_{34}	16	x	Oct. 3	S	·45217	14 56 28·21	+14 32 50·12	+2·55	—6·22	+38·72	+15·20
	17	y			·50379	55 55·69	12·92	+0·48	—6·10	38·79	15·16
	18	y			·52483	42·43	31 57·75	—0·39	—6·10	38·79	15·16
	19	x			·54360	30·60	44·21	—1·17	—6·13	38·73	15·21
IV_{35}	22	x	Oct. 4	S	·37600	14 46 44·66	+14 21 39·80	+4·97	—6·67	+38·83	+15·29
	23	x			·39230	34·34	27·88	+4·51	—6·56	38·84	15·29
IV_{36}	27	x	Oct. 4	S	·63548	14 44 0·10	+14 18 29·83	—4·61	—6·59	+38·87	+15·32
IV_{37}	29	x	Oct. 6	S	·37343	14 25 34·96	+13 56 59·75	+4·86	—6·69	+39·06	+15·48
	30	t			·39091	23·84	46·63	+4·34	—6·57	38·94	15·58
	31	t			·40593	14·26	35·34	+3·86	—6·48	38·94	15·58
	32	x			·42051	4·97	24·39	+3·36	—6·40	39·06	15·48

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OF OBSERVED AND TABULAR QUANTITIES.

Set.	Rotation No.	Star.	Approximate Distance.	Observed Position-Angle.	Refraction.	Observed Position-Angle corrected for Refraction.	Tabular Position-Angle.	O–C.	O–C. on Great Circle.	fp'	fp''	fp'''
			″	′ ″	″	° ′ ″	° ′ ″	′ ″	″			
IV_{34}	16	x	818	57 14	— 16	31 56 58	31 55 44	+ 1 14	+0·294	+·848	—·530	+·539
	17	y	990	50 49	— 11	199 50 38	199 51 26	— 0 48	—0·230	—·941	+·340	—·250
	18	y	1009	18 48	— 10	200 18 38	200 17 41	+ 0 57	+0·279	—·938	+·347	—·176
	19	x	729	44 10	— 13	30 43 57	30 42 14	+ 1 43	+0·364	+·860	—·510	+·216
IV_{35}	22	x	130	20 25	+ 65	279 21 30	279 23 10	— 1 40	—0·063	+·163	+·987	—·579
	23	x	142	43 48	+ 51	273 44 39	273 59 52	—15 13	—0·620	+·068	+·998	—·625
IV_{36}	27	x	346	46 36	— 47	240 45 49	240 43 49	+ 2 0	+0·201	—·488	+·873	—·357
IV_{37}	29	x	1994	4 52	— 10	223 4 42	223 3 34	+ 1 8	+0·657	—·731	+·682	—·801
	30	t	1312	24 23	— 16	38 24 7	38 21 15	+ 2 52	+1·094	+·784	—·621	+·738
	31	t	1297	22 22	— 16	38 22 6	38 19 18	+ 2 48	+1·056	+·785	—·620	+·696
	32	x	2041	4 5	— 12	223 3 53	223 0 52	+ 3 1	+1·791	—·731	+·682	—·674

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CHAPTER II.

FORMATION OF A PRELIMINARY SYSTEM OF WEIGHTS.

The square of the mean accidental error of a single observation has been computed from the agreement *inter se* of the values of O–C. for each star of each set of observations. The means of the values of ε^2 thus determined for each observer are the following :—

		Distances < 4000″ ε^2	No. of Determinations.	> 4000″ ε^2	No. of Determinations.
Cape	Gill (1st programme, 4 pointings)	0·0919	12	0·1173	13
	Gill (2nd „ 8 „)	·0296	19	·0529	25
Yale	Elkin 4 pointings	·2405	16	·1401	14
	Hall do.	·2903	12	·3540	17
Leipzig	Peter do.	·0505	10	·0562	21
Göttingen	Schur do.	·1097	7	·0391	11
	Ambronn do.	All distances combined		·0528	7
Bamberg ...	Hartwig do.	do.	do.	·0259	5

If in Gill's observations a measure of 8 pointings is considered equal to two observations of 4 pointings each, we have in the mean—

	Distances <4000″ ε^2	>4000″ ε^2
Gill, for one observation of 4 pointings	0·0719	0·1097

and this method of reckoning the number of observations and these values of ε^2 are adopted in computing the weights. It seems improbable that Elkin's and Schur's observations of the shorter distances have *in reality* a larger mean error than their greater distances ; as a preliminary step a mean value has been adopted for all distances observed by them, viz. :—

	ε^2
Elkin, for one observation of any distance	0·1937
Schur „ „ „ „	0·0666

The observations of Ambronn and Hartwig are not sufficiently numerous for classification according to distance.

According to Auwers' discussion of the meridian observations of the *Sappho* comparison stars, the mean weight of a determination of the Right Ascension of a star is about 16, and the mean weight in Declination about 9 (when an estimated mean error in R.A. in seconds of time corresponds with $\sqrt{0{\cdot}001}$, and in Declination, in seconds of arc, with $\sqrt{0{\cdot}1}$).

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Reckoned in seconds of arc on the great circle (for mean Declination $+12°$) this corresponds with a mean error of the star's place in a direction at right angles to the meridian of $\pm 0''\cdot116$, and of $+0''\cdot105$ in Declination. In the case of the *Victoria* comparison stars the discussion of the *mean error* (Chap. X.) showed that Auwers' estimated weights should be diminished 8 per cent. in Right Ascension and be increased 41 per cent. in Declination. If the same holds good in the *Sappho* series (which there are no independent means of testing) the mean errors of the co-ordinates would be—

$$\epsilon_x = \pm 0''\cdot121 \; ; \quad \epsilon_y = \pm 0''\cdot088$$

The planet's position in the direction of measurement is affected by a mean error

$$\pm \epsilon_s = \sqrt{(\epsilon_x \sin p)^2 + (\epsilon_y \cos p)^2}$$

in consequence of the uncertainty in the star's place. The position-angle (p) in the *Sappho* observations is seldom very different from $+45°$ or $-45°$; with this value of p, and the above values ϵ_x and ϵ_y we have—

$$\epsilon_s = \pm 0''\cdot10$$

The mean error of the scale-division determinations is assumed the same as in the case of *Victoria*, viz. :—

For the Cape	± 0·02
„ Yale	± ·04
„ Leipzig	± ·06
„ Göttingen	± ·03
„ Bamberg	± ·06

The mean accidental error of the computation of the ephemeris is also taken as before at $\pm 0''\cdot03$.

With these data the following table of weights has been derived, where an observation of weight unity has an estimated mean error of $+0''\cdot20$.

PRELIMINARY TABLE OF WEIGHTS FOR SAPPHO OBSERVATIONS.

No. of Obs.	Gill. <4000″	Gill. >4000″	Elkin. All Distances.	Hall. <4000″	Hall. >4000″	Peter. <4000″	Peter. >4000″	Schur. All Distances.	Ambronn. All Distances.	Hartwig. All Distances.
1	0·48	0·33	0·19	0·13	0·11	0·62	0·50	0·51	0·62	0·99
2	0·84	0·60	0·37	·25	·21	1·00	0·84	0·89	1·05	1·46
3	1·13	0·84	0·52	·37	·31	1·28	1·09	1·18	1·36	1·73
4	1·36	1·03	0·66	·47	·40	1·48	1·29	1·40	1·60	1·90
5	1·56	1·20	0·78	·57	·48	1·63	1·44	1·59	1·78	
6	1·72	1·35	0·89	·66	·56	1·75	1·57	1·75	1·94	

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CHAPTER III.

FORMATION AND SOLUTION OF THE EQUATIONS OF CONDITION.

From the preceding Table of Observed and Tabular Results, the equations of condition for the double distances have been formed as follows :—

1. In each set of observations the mean values of O–C., f', f'' and f''' were taken for each of the two stars. The equation resulting from each star is then—

$$f'x' + f''y' + f'''z = \text{O–C.} + s\,\Delta\sigma + \frac{1}{s}\,\text{N}$$

as explained in the discussion of the *Victoria* observations (pp. 391–394), and where for N is substituted the initial of the observer.

2. The values of O–C. require the following corrections :—

a. The discussion of the *Victoria* triangulation showed that the Right Ascensions of the comparison stars required a correction of $+0''\cdot036$ per magnitude, and as the *Victoria* and *Sappho* observations were discussed by Auwers with the same system of corrections in R.A. on account of magnitude, and as the observations as a whole were made by nearly the same observers, it may be assumed that the places of the *Sappho* comparison stars require similar corrections, viz.:—

Mag.	$\Delta\alpha$.	$\mu = \Delta\alpha \cos\delta$
	″	″
6·0	− 0·072	− 0·070
7·0	− ·036	− ·035
8·0	·000	·000
9·0	+ ·036	+ ·035

The corresponding corrections ($= f'\mu$) have been applied to the values of O–C.

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b. In the conversion of the Yale scale-readings into arc the fact was overlooked that Dr. Elkin had not applied the corrections for division-error. The values of O–C. in the equations resulting from the Yale observations have accordingly been corrected from the following table :—

Distance.	Correction.	Distance.	Correction.
"	"	"	"
1000	0·00	6000	+ 0·01
2000	— ·01	6200	— ·01
3000	— ·04	6400	— ·03
4000	— ·01	6600	— ·06
5000	+ ·01	6800	— ·10
5500	+ ·02	7000	— ·16

3. After the above corrections *a* and *b* were applied, the term $\Delta\sigma$ was eliminated from the equations of each set, in the same manner as was done in the discussion of the *Victoria* observations (p. 393).

4. A preliminary investigation showed that the variations of x' and y' could be very approximately developed in terms of t and t^2 (where t is the time expressed in days from October $5^{d}\cdot5$). Therefore, in the equations obtained as above, after eliminating $\Delta\sigma$, it became only necessary to put

$$x' = \alpha + \frac{t}{10}\beta + \frac{t^2}{100}\gamma$$

$$y' = \alpha' + \frac{t}{10}\beta' + \frac{t^2}{100}\gamma'$$

5. To investigate the effect of an error in the adopted value of the lunar equation, the factors of that equation in Right Ascension and Declination were computed for the mean epoch of each set of observations by the formulæ (p. 415). Putting these factors respectively $= f_l'$ and f_l'', the factor in distance is—

$$f_l = f'.f_l' + f''.f_l''$$

Then writing n = (the value of O–C., corrected as above) our complete equations become—

$$\left.\begin{array}{l} f'\alpha + f''\alpha' + f'\frac{t}{10}\beta + f\frac{t^2}{100}\gamma + f''\frac{t}{10}\beta' + f''\frac{t}{100}\gamma' \\ \qquad\qquad + f'''z + f_l\, dL \end{array}\right\} = n + q\,m$$

where f', f'', f''' and q are the factors of x', y' z and N respectively, as modified by the elimination of $\Delta\sigma$.

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The following are the resulting equations :—

GROUP I.

Date. Sept.	No. in Group.	Stars.	Factors of a	a'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I	II.
							CAPE.								
d.											″			″	″
18·43	1	ζ μ	+0·69	+0·72	−1·18	+2·01	−1·23	+2·09	+0·87	+1·02	−0·37	+0·01 G	1·20	−0·14	−0·13
18·65	2	ε λ	+ ·62	− ·76	−1·05	+1·77	+1·28	−2·15	− ·86	+ ·31	− ·38	+ ·05 G	1·20	− ·24	− ·25
19·44	3	ζ μ	+ ·70	+ ·71	−1·12	+1·80	−1·15	+1·84	+ ·85	+1·05	− ·38	+ ·07 G	1·44	− ·18	− ·16
22·43	4	ζ κ	+ ·79	+ ·60	−1·04	+1·36	−0·79	+1·03	+ ·81	+ ·86	− ·14	+ ·28 G	1·68	·00	+ ·03
							YALE.								
19·65	5	ε λ	+ ·61	− ·79	−0·97	+1·54	+1·25	−1·98	+ ·72	+ ·24	− ·07	+ ·04 H	0·96	+ ·11	+ ·11
22·61	7	γ λ	+ ·86	− ·52	−1·11	+1·43	+ ·67	−0·86	+ ·84	+ ·32	− ·21	+ ·04 E	1·78	− ·02	·00
							LEIPZIG.								
18·39	9	ε λ	+ ·63	− ·75	−1·08	+1·86	+1·28	−2·20	+ ·81	+ ·33	− ·21	+ ·05 P	2·58	− ·01	− ·02
18·67	10	ζ μ	+ ·70	+ ·72	−1·17	+1·97	−1·21	+2·04	− ·71	+1·03	− ·06	+ ·03 P	2·18	+ ·12	+ ·11
20·38	11	ε λ	+ ·60	− ·79	− ·91	+1·38	+1·19	−1·82	+ ·84	+ ·18	− ·08	+ ·03 P	1·68	+ ·10	+ ·09
20·65	12	ζ κ	+ ·82	+ ·54	−1·23	+1·82	− ·81	+1·20	− ·63	+1·05	+ ·05	− ·08 P	2·00	+ ·20	+ ·20
22·38	13	γ λ	+ ·86	− ·51	−1·13	+1·48	+ ·67	− ·88	+ ·78	+ ·36	− ·04	+ ·04 P	1·68	+ ·15	+ ·15
							GÖTTINGEN.								
18·42	14	ε λ	+0·63	−0·75	−1·08	+1·85	+1·28	−2·19	+ ·77	+ ·33	− ·18	+ ·05 An	2·10	+ ·02	+ ·01
18·70	15	ζ μ	+ ·69	+ ·72	−1·16	+1·95	−1·21	+2·03	− ·77	+1·02	− ·22	+ ·03 An	1·67	− ·05	− ·05

No. 6 is omitted because there was obviously some large systematic error which was not explained till after the original computations had been made. Dr. Elkin, in reply to an enquiry on the subject, traces the explanation to an error of one hour throughout the record of the chronometer times. The corresponding alterations are made in the printed comparison of Observed and Tabular Quantities, Table B. The observation would then have been used in the definitive derivation of the parallax, but unfortunately no observations of the pair γ λ were secured in the Southern Hemisphere.

No. 8 is unsymmetrical and incomplete, and has been rejected.

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GROUP II.

Date. Sept.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							CAPE.				″			″	
23·41	1	α κ	+0·76	+0·65	−0·91	+1·10	−0·78	+0·95	+0·87	+0·69	+0·00	−0·04 G	1·20	+0·11	+0·11
23·65	2	γ ι	+ ·65	− ·76	− ·77	+ ·90	+ ·90	−1·06	− ·91	− ·05	− ·10	− ·05 G	1·44	·00	− ·01
24·42	3	α κ	+ ·74	+ ·67	− ·82	+ ·91	− ·74	+ ·82	+ ·86	+ ·51	+ ·11	+ ·02 G	1·20	+ ·19	+ ·19
25·41	4	α κ	+ ·73	+ ·68	− ·74	+ ·74	− ·69	+ ·69	+ ·86	+ ·26	− ·38	+ ·09 G	1·44	− ·33	− ·32
26·41	6	α θ	+ ·80	+ ·58	− ·73	+ ·67	− ·53	+ ·48	+ ·82	− ·04	− ·00	− ·08 G	1·68	+ ·05	+ ·04
26·62	7	γ η	+ ·24	− ·97	− ·22	+ ·19	+ ·86	− ·76	− ·82	− ·23	− ·03	+ ·05 G	1·20	+ ·04	+ ·04
27·40	8	α ζ	+ ·63	+ ·77	− ·51	+ ·42	− ·62	+ ·51	+ ·89	− ·22	− ·20	± ·00 G	1·68	− ·20	− ·20
							YALE.								
23·63	9	γ ι	+ ·65	− ·76	− ·77	+ ·91	+ ·90	−1·07	+ ·75	− ·05	− ·36	− ·05 H	0·88	− ·21	− ·21
23·94	10	α κ	+ ·75	+ ·66	− ·87	+1·00	− ·77	+ ·88	− ·84	+ ·59	− ·13	− ·01 E	0·57	− ·09	− ·10
26·93	11	α θ	+ ·79	+ ·61	− ·68	+ ·58	− ·52	+ ·44	− ·84	− ·19	− ·12	+ ·04 H	0·96	− ·14	− ·15
27·61	12	γ η	+ ·22	− ·98	− ·17	+ ·13	+ ·77	− ·61	+ ·65	− ·16	+ ·31	+ ·02 H	1·12	+ ·43	+ ·45
27·91	13	α ζ	+ ·67	+ ·73	− ·51	+ ·39	− ·55	+ ·43	− ·80	− ·38	− ·36	+ ·20 E	1·78	− ·41	− ·36
							LEIPZIG.								
23·38	14	γ ι	+ ·63	− ·76	− ·77	+ ·93	+ ·91	−1·11	+ ·84	− ·02	− ·06	− ·05 P	2·77	+ ·10	+ ·10
23·65	15	α κ	+ ·75	+ ·66	− ·89	+1·06	− ·78	+ ·92	− ·70	+ ·66	+ ·29	− ·03 P	1·00	+ ·34	+ ·33
24·37	16	γ ι	+ ·67	− ·74	− ·75	+ ·84	+ ·82	− ·91	+ ·86	− ·08	− ·36	− ·07 P	1·46	− ·21	− ·20
26·34	17	γ η	+ ·26	− ·96	− ·24	+ ·22	+ ·88	− ·81	+ ·81	− ·24	− ·31	+ ·06 P	1·00	− ·19	− ·18
							GÖTTINGEN.								
23·42	18	γ ι	+ ·64	− ·76	− ·77	+ ·93	+ ·91	−1·11	+ ·77	− ·02	− ·27	− ·05 An	2·10	− ·12	− ·12

No. 5. A wrong star was apparently observed in lieu of β.

GROUP III.

Date Sept.	Set	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							CAPE.				″			″	″
28·64	1	ε δ	+0·76	−0·61	−0·52	+0·36	+0·42	−0·28	−0·89	+0·50	+0·04	−0·13 G	1·68	+0·10	+0·09
29·39	2	κ ζ	+ ·61	+ ·79	− ·37	+ ·22	− ·49	+ ·30	+ ·89	− ·66	− ·22	− ·04 G	2·39	− ·25	− ·26
30·40	3	κ ζ	+ ·62	+ ·78	− ·32	+ ·16	− ·40	+ ·20	+ ·87	− ·84	− ·07	+ ·07 G	2·39	− ·11	− ·11

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GROUP III.—*continued.*

Date. Oct.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							CAPE—*continued.*								
1·40	4	y* α	+0·50	+0·87	−0·21	+0·09	−0·35	+0·14	+0·87	−0·88	+0·19	−0·29 G	3·44	+0·12	+0·08
1·61	5	u η	+ ·82	− ·58	− ·32	+ ·12	+ ·22	− ·08	− ·85	− ·63	− ·13	+ ·04 G	1·20	− ·09	− ·08
2·61	6	u η	+ ·78	− ·61	− ·23	+ ·06	+ ·17	+ ·05	− ·85	− ·53	− ·08	+ ·05 G	2·06	− ·04	− ·03
Sept.							YALE.								
28·61	7	z δ	+ ·75	− ·61	− ·52	+ ·36	+ ·42	− ·29	+ ·79	− ·48	− ·17	− ·14 E	1·56	− ·06	− ·10
28·92	8	y* ζ	+ ·58	+ ·82	− ·38	+ ·25	− ·54	+ ·35	− ·80	− ·54	+ ·52	− ·07 H	1·05	+ ·44	+ ·40
Oct.															
1·88	9	y* α	+ ·48	+ ·87	− ·17	+ ·06	− ·32	+ ·12	− ·73	− ·89	+ ·12	± ·00 E	1·56	± ·00	− ·02
2·59	10	u η	+ ·78	− ·60	− ·23	+ ·06	+ ·17	− ·05	+ ·82	− ·53	− ·35	+ ·05 E	1·78	− ·26	− ·23
2·91	11	x α	+ ·58	+ ·81	− ·15	+ ·04	− ·21	+ ·06	− ·83	− ·99	− ·13	+ ·40 H	1·34	− ·26	− ·20
Sept.							LEIPZIG.								
30·38	12	u η	+ ·80	− ·54	− ·41	+ ·21	+ ·27	− ·14	+ ·74	− ·62	+ ·27	+ ·02 P	1·68	+ ·36	+ ·37
							GÖTTINGEN.								
30·43	13	u η	+ ·80	− ·54	− ·41	+ ·21	+ ·27	− ·14	+ ·64	− ·62	+ ·04	+ ·02 An	2·10	+ ·13	+ ·14

GROUP IV.

Date. Oct.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							CAPE.								
5·38	4	t x	+0·70	+0·71	−0·01	±0·00	−0·01	±0·00	+0·87	−0·84	+0·08	−0·55 G	2·72	±0·00	−0·07
6·39	5	t x	+ ·65	+ ·77	+ ·06	+ ·01	+ ·07	+ ·01	+ ·85	− ·64	− ·03	+ ·26 G	2·72	− ·12	− ·11
							YALE.								
5·59	11	t x	+ ·68	+ ·74	+ ·01	± ·00	+ ·01	± ·00	+ ·03	− ·81	− ·14	− ·33 H	0·52	− ·25	− ·34
							LEIPZIG.								
3·65	14	x y	+ ·44	+ ·89	− ·08	+ ·01	− ·17	+ ·03	− ·82	− ·90	+ ·41	+ ·71 P	2·96	+ ·27	+ ·24

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GROUP IV.—*continued.*

Date. Oct.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							GÖTTINGEN.				″			″	″
6·64	20	t x	+0·63	+0·77	+0·07	+0·01	+0·09	+0·01	−0·82	−0·59	+0·07	+0·50 S	1·78	−0·08	+0·11
							BAMBERG.								
3·64	21	x y	+ ·45	+ ·89	− ·08	+ ·01	− ·17	+ ·03	− ·77	− ·90	+ ·48	+ ·66 Hg	2·92	+ ·34	+ ·34

Sets 1, 2, 3, 9, 10, 15, 16, 17, 18, 19, 22 consist of measures of the distance of *Sappho* from the single star x.

Sets 6, 12, 13 consist of measures of distance of *Sappho* from the single star t.

In sets 7 and 8 the star y* was observed at Yale instead of y so that the planet's position-angles from the comparison stars differ about 90° instead of nearly 180° as would have been the case if the stars x and y instead of x and y* had been employed. The term $\Delta\sigma$ cannot, therefore, be eliminated from sets 7 and 8.

GROUP V.

Date. Oct.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
d.							CAPE.				″			″	″
10·36	1	l x	+0·69	+0·72	+0·34	+0·17	+0·35	+0·17	+0·87	+0·30	+0·24	+0·03 G	2·06	+0·15	+0·15
10·56	2	m v	+ ·69	− ·72	+ ·36	+ ·18	− ·36	− ·19	− ·84	+ ·37	− ·14	− ·13 G	2·39	− ·09	− ·10
12·36	3	i w	+ ·89	+ ·44	+ ·62	+ ·42	+ ·31	+ ·20	+ ·75	+ ·82	+ ·09	+ ·04 G	2·06	+ ·04	+ ·05
12·57	4	m s	+ ·37	− ·92	+ ·27	+ ·19	− ·65	− ·46	− ·84	+ ·13	− ·10	− ·03 G	2·06	− ·01	− ·01
13·57	5	k s	+ ·53	− ·85	+ ·43	+ ·34	− ·69	− ·56	− ·86	+ ·25	+ ·07	+ ·04 G	2·39	+ ·15	+ ·16
							YALE.								
10·57	6	m v	+ ·69	− ·72	+ ·36	+ ·18	− ·36	− ·19	+ ·83	+ ·37	− ·15	− ·13 E	1·32	− ·05	− ·07
10·87	7	l x	+ ·70	+ ·71	+ ·37	+ ·20	+ ·39	+ ·21	− ·82	+ ·42	− ·20	+ ·06 H	0·42	− ·34	− ·34
							LEIPZIG.								
12·30	8	m s	+ ·36	− ·93	+ ·25	+ ·17	− ·64	− ·43	+ ·86	+ ·13	− ·24	− ·02 P	2·58	− ·09	− ·08
							GÖTTINGEN.								
12·70	9	i w	+ ·90	+ ·42	+ ·65	+ ·47	+ ·31	+ ·22	− ·87	+ ·88	− ·23	+ ·07 S	1·02	− ·33	− ·31

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GROUP VI.

Date. Oct.	Set.	Stars.	Factors of a	a'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
							CAPE.								
d.											″			″	″
14·38	1	h t	+0·57	+0·82	+0·50	+0·45	+0·73	+0·65	+0·79	+0·88	+0·04	—0·01 G	2·06	—0·04	—0·04
14·55	2	f s	+ ·76	— ·64	+ ·70	+ ·62	— ·58	— ·52	— ·81	+ ·54	— ·24	— ·05 G	2·06	— ·18	— ·19
15·55	3	f s	+ ·79	— ·60	+ ·80	+ ·80	— ·61	— ·61	— ·80	+ ·58	— ·18	— ·05 G	2·06	— ·12	— ·13
18·35	4	h o	+ ·59	+ ·79	+ ·76	+ ·97	+1·03	+1·31	+ ·81	+ ·90	+ ·10	— ·11 G	2·72	+ ·06	+ ·06
18·54	5	e r	+ ·80	— ·58	+1·04	+1·36	— ·76	— ·99	— ·79	+ ·39	— ·10	+ ·05 G	2·70	— ·01	— ·02
							YALE.								
15·57	6	f s	+ ·79	— ·60	+ ·80	+ ·80	— ·61	— ·61	+ ·78	+ ·58	— ·26	— ·05 H	0·80	— ·15	— ·15
15·84	7	c v	+ ·94	+ ·36	+ ·97	+1·01	+ ·37	+ ·39	— ·73	+1·14	+ ·05	— ·01 E	1·32	± ·00	— ·01
16·54	8	f r	+ ·66	— ·76	+ ·73	+ ·81	— ·83	— ·93	+ ·84	+ ·32	— ·16	± ·00 E	1·32	— ·02	— ·02
16·85	9	c v	+ ·94	+ ·35	+1·07	+1·21	+ ·40	+ ·45	— ·77	+1·12	+ ·10	+ ·03 H	0·80	+ ·06	+ ·06
17·55	10	e r	+ ·83	— ·55	+1·01	+1·20	— ·67	— ·80	+ ·80	+ ·52	— ·02	+ ·05 H	0·80	+ ·11	+ ·11
18·55	11	e r	+ ·80	— ·58	+1·04	+1·36	— ·76	— ·99	+ ·81	+ ·40	— ·29	+ ·05 E	1·32	— ·15	— ·14
18·85	12	h o	+ ·53	+ ·83	+ ·71	+ ·94	+1·11	+1·47	— ·80	+ ·82	— ·06	+ ·02 H	1·34	— ·15	— ·15
							LEIPZIG.								
15·60	13	c v	+ ·94	+ ·36	+ ·95	+ ·96	+ ·36	+ ·37	— ·66	+1·14	+ ·12	— ·03 P	2·58	+ ·07	+ ·06
16·30	14	f r	+ ·66	— ·76	+ ·71	+ ·77	— ·82	— ·89	+ ·89	+ ·32	+ ·08	± ·00 P	2·58	+ ·22	+ ·22
16·59	15	c v	+ ·93	+ ·36	+1·03	+1·15	+ ·40	+ ·44	— ·64	+1·13	+ ·23	+ ·01 P	2·18	+ ·19	+ ·18
							GÖTTINGEN.								
15·37	16	f s	+ ·79	— ·61	+ ·78	+ ·77	— ·60	— ·59	+ ·72	+ ·57	+ ·10	— ·05 S	1·78	+ ·21	+ ·20
15·58	17	c v	+ ·94	+ ·36	+ ·95	+ ·96	+ ·36	+ ·37	— ·58	+1·14	± ·00	— ·03 S	1·78	— ·05	— ·07
16·37	18	f r	+ ·66	— ·76	+ ·72	+ ·77	— ·83	— ·89	+ ·76	+ ·32	+ ·10	± ·00 S	1·78	+ ·24	+ ·24
16·62	19	c v	+ ·93	+ ·36	+1·03	+1·16	+ ·40	+ ·44	— ·70	+1·13	+ ·15	+ ·01 S	1·78	+ ·11	+ ·11

GROUP VII.

Date. Oct.	Set.	Stars.	Factors of a	a'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
							CAPE.								
d.											″			″	″
19·34	1	d o	+0·65	+0·76	+0·90	+1·25	+1·04	+1·46	+0·82	+0·83	—0·03	—0·14 G	2·39	—0·05	— ·05
21·54	2	c n	+ ·71	— ·67	+1·13	+1·82	—1·08	—1·73	—0·81	—0·02	— ·47	+ ·09 G	2·39	— ·34	— ·37
24·54	4	c g	+ ·27	— ·96	+ ·52	+ ·99	—1·82	—3·48	— ·76	— ·11	+ ·01	— ·11 G	2·39	+ ·12	+ ·07
27·34	6	a h	+ ·59	+ ·81	+1·29	+2·82	+1·76	+3·86	+ ·75	— ·81	— ·09	+ ·04 G	2·39	+ ·04	+ ·05

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GROUP VII.—*continued.*

Date. Oct.	Set.	Stars.	Factors of α	α'	β	γ	β'	γ'	z	dL	n	N	p	Residuals. I.	II.
						YALE.									
19·82	7	d o	+0·64	+0·77	+ ·91	+1·31	+1·10	+1·58	−0·75	+0·74	+0·32	−0·08	E	0·74	+0·26	+0·23
21·61	8	c n	+ ·70	− ·69	+1·13	+1·83	−1·10	−1·78	+ ·61	− ·04	− ·23	+ ·09	H	0·88	− ·06	− ·06
21·81	9	d o	+ ·64	+ ·77	+1·05	+1·72	+1·25	+2·04	− ·73	+ ·35	− ·22	+ ·08	E	1·32	− ·25	− ·22
23·56	10	c n	+ ·63	− ·75	+1·15	+2·07	−1·36	−2·46	+ ·73	−0·22	− ·06	+ ·03	H	0·80	+ ·13	+ ·11
23·79	11	d h	+ ·75	+ ·67	+1·37	+2·51	+1·22	+2·23	− ·70	− ·16	− ·09	− ·10	E	1·32	− ·05	− ·10
						LEIPZIG.									
23·28	12	c n	+ ·64	− ·75	+1·14	+2·02	−1·35	−2·38	+ ·86	− ·19	+ ·05	+ ·04	P	1·00	+ ·25	+ ·22
24·29	13	c g	+ ·27	− ·95	+ ·50	+ ·95	−1·79	−3·37	+ ·79	− ·12	− ·15	− ·09	P	2·37	+ ·01	− ·02
26·56	14	a h	+ ·59	+ ·81	+1·24	+2·62	+1·72	+3·62	− ·78	− ·70	+ ·05	− ·03	P	1·00	+ ·11	+ ·11
27·31	15	b g	+ ·92	− ·39	+2·00	+4·36	−0·85	−1·85	+ ·65	− ·72	− ·15	− ·08	P	2·00	+ ·14	+ ·08
						GÖTTINGEN.									
21·54	17	d o	+ ·64	+ ·77	+1·02	+1·64	+1·23	+1·97	− ·71	+ ·42	− ·10	+ ·06	S	1·78	− ·13	− ·11
26·37	18	d g	+ ·71	− ·70	+1·48	+3·08	−1·47	−3·06	+ ·65	− ·41	− ·58	+ ·78	S	1·78	− ·34	− ·07
27·39	19	b g	+ ·92	− ·39	+2·02	+4·42	− ·85	−1·85	+ ·40	− ·74	− ·21	− ·08	S	1·06	+ ·08	− ·02
						BAMBERG.									
19·61	20	d o	+ ·64	+ ·77	+ ·91	+1·28	+1·08	+1·52	− ·85	+ ·79	− ·10	− ·11	Hg	2·92	+ ·03	+ ·02
						The following equations have been rejected :—									
23·36	3	d h	+ ·76	+ ·65	+1·37	+2·43	+1·16	+2·07	+ ·72	− ·05	+ ·63	− ·33	F	...	− ·71	...
19·59	16	d o	+ ·64	+ ·77	+ ·91	+1·28	+1·08	+1·52	− ·81	+ ·79	+1·12	− ·11	S	...	−1·05	...

No. 3 is an observation by Mr. Finlay which was stopped by cloud and is unsymmetrical and incomplete.

No. 16 contains some error which cannot be traced with certainty. It appears that the electric dial tripped, and there is some uncertainty in the true clock-error.

No. 5 is an observation of a single distance.

Having regard to the weights of the different equations, the following are the resulting normal equations derived by the method of least squares :—

											G	E	H	P	An	S	Hg
										″							
+ 76·51α	+ 3·38α'	+ 15·05β	+108·86γ	− 2·03β'	− 6·12γ'	+ 10·58z	+17·54dL	=	− 6·04	−1·04	+0·40	−0·05	+0·61	+0·06	+1·50	+0·66
+ 3·38	+ 83·70	− 1·87	− 6·13	+ 12·72	+116·96	− 9·81	+ 1·05	=	+ 8·59	− ·95	+ ·33	+ ·22	+1·96	+ ·02	−0·11	+1·47
+ 15·05	− 1·87	+109·04	− 50·13	− 6·26	− 3·01	− 16·10	+ 8·33	=	+ 1·19	− ·61	− ·28	+ ·12	− ·62	− ·11	+2·08	−0·46
+108·86	− 6·13	+ 50·13	+264·46	− 3·11	− 20·80	+ 21·18	+36·47	=	−17·56	+ ·48	− ·05	+ ·35	− ·90	+ ·21	+4·03	−0·40
− 2·03	+ 12·72	− 6·26	− 3·11	+117·08	+ 58·56	+ 2·27	+ 3·76	=	+ 3·49	− ·20	− ·33	− ·16	+ ·43	− ·01	−1·72	−0·68
− 6·12	+116·96	− 3·01	− 20·80	+ 58·56	+296·45	− 30·05	+26·24	=	+10·76	+ ·58	− ·08	− ·20	+ ·52	− ·02	−3·81	−0·43
+ 10·58	− 9·81	− 16·10	+ 21·18	+ 2·27	− 30·05	+102·23	− 8·72	=	− 5·67	−1·04	− ·33	− ·38	−1·77	− ·01	−0·04	−1·20
+ 17·54	+ 1·05	+ 8·33	+ 36·47	+ 3·76	+ 26·24	− 8·72	+67·74	=	− 2·45	+1·51	− ·10	− ·30	−1·89	+ ·06	−1·02	−2·00

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The solution of these equations gives :—

a =	+0·0262	+0·0390 G	+0·0121 E	−0·0067 H	+0·0279 P	−0·0054 S	−0·0013 An	+0·0235 Hg	
a' =	+ ·1269	− ·0222	+ ·0073	+ ·0078	+ ·0387	+ ·0315	+ ·0010	+ ·0325	
β =	+ ·0435	− ·0122	− ·0030	− ·0007	− ·0059	+ ·0114	− ·0016	− ·0051	
γ =	− ·0816	+ ·0184	− ·0042	+ ·0052	− ·0082	+ ·0171	+ ·0016	− ·0050	
β' =	+ ·0314	− ·0090	− ·0017	+ ·0007	+ ·0134	− ·0023	− ·0001	+ ·0039	
γ' =	− ·0277	+ ·0096	− ·0032	− ·0036	− ·0155	− ·0224	− ·0005	− ·0133	Weight.
z =	− ·0312	− ·0094	− ·0044	− ·0049	− ·0228	− ·0064	− ·0005	− ·0172	92·03
dL =	− ·0013	+ ·0197	− ·0013	− ·0048	− ·0280	− ·0166	+ ·0007	− ·0297	56·10

The only available determinations of the personal terms G, E, &c., are those derived from the discussion of the observations of *Victoria*. The preliminary values of these terms will be found at p. 459, their definitive corrections and mean errors at p. 522. The definitive values are :—

			Mean error.
G	=	+0·100	±0·0178
E	=	+ ·347	± ·0396
H	=	+ ·210	± ·0436
P	=	− ·003	± ·0301
S	=	+ ·412	± ·0440
Hg	=	+ ·032	± ·0715
An	=	+ (·100)	

The value of An is not determined, as Dr. Ambronn did not take part in the observations of *Victoria* ; but it will be seen that the co-efficients of An are practically zero in the resulting values of the unknowns. We assume for An the value + 0·100 as sufficiently exact for use.

Indeed, strictly speaking, one cannot be sure that these terms will be really the same for the two planets, as *Sappho* is much fainter than *Victoria*, and the observers may have, on this account, crossed the images further with the fainter object. (*See* Dr. Elkin's note, p. 456.) But, as the conditions of observation were in general more favourable for observing *Sappho* in the Northern Hemisphere than they were for *Victoria*, we may assume the above constants to be very near the truth for the *Sappho* observations.

The best plan will be to discuss the observations on two assumptions. First, that the co-efficients are insensible ; second, that they have the same values as derived from the *Victoria* observations, that is to say, we have :—

		I. Neglecting personal terms.		II. Including personal terms.
a	=	+0·0262	=	+0·0235
a'	=	+ ·1269		+ ·1428
β	=	+ ·0435		+ ·0464
γ	=	− ·0816		+ ·0732
β'	=	+ ·0314		+ ·0292
γ'	=	− ·0277		− ·0388
z	=	− ·0312		− ·0377
dz	=	− ·0013		− ·0083

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The residuals (in the sense O–C.) found by substituting the above values in the original equations, will be found in the two right-hand columns marked "Residuals" (pp. 64–69). Although z and ΔL are apparently determined with considerable accuracy by this solution, the values so found cannot be considered definitive for reasons which will be presently discussed.

Thus, if we take the normals for each group separately, and substitute in them the numerical equivalents of β, β', γ and γ' from Solution I., and, to form a second set of absolute terms, substitute the numerical equivalents of β, γ, β', γ' from Solution II., and also the equivalents of G, E, H, &c., we obtain the following normals in α, α' and z in terms of dL.

				I. Without personal terms.		II. With personal terms.
Group I.	$+11{\cdot}40\,\alpha$	$-0{\cdot}64\,\alpha'$	$+5{\cdot}03\,z$	$=+0''{\cdot}39$	or	$+0''{\cdot}29 - 10{\cdot}08\,dL$
	$-0{\cdot}64$	$+10{\cdot}42$	$-5{\cdot}36$	$=+1{\cdot}38$		$+1{\cdot}65 - 4{\cdot}32$
	$+5{\cdot}03$	$-5{\cdot}36$	$+13{\cdot}75$	$=-1{\cdot}08$		$-1{\cdot}20 - 1{\cdot}60$
Group II.	$+9{\cdot}93\,\alpha$	$+0{\cdot}63\,\alpha'$	$+5{\cdot}14\,z$	$=-0{\cdot}68$	or	$-0{\cdot}69 - 0{\cdot}82\,dL$
	$+0{\cdot}63$	$+13{\cdot}36$	$-2{\cdot}07$	$=+1{\cdot}07$		$+1{\cdot}30 - 1{\cdot}85$
	$+5{\cdot}14$	$-2{\cdot}07$	$+15{\cdot}94$	$=-0{\cdot}70$		$-0{\cdot}88 - 0{\cdot}90$
Group III.	$+11{\cdot}26\,\alpha$	$+0{\cdot}06\,\alpha'$	$+3{\cdot}20\,z$	$=+0{\cdot}21$	or	$+0{\cdot}23 + 10{\cdot}78\,dL$
	$+0{\cdot}06$	$+12{\cdot}41$	$+2{\cdot}88$	$=+1{\cdot}13$		$+1{\cdot}17 + 4{\cdot}28$
	$+3{\cdot}20$	$+2{\cdot}88$	$+16{\cdot}37$	$=-0{\cdot}36$		$-0{\cdot}54 + 3{\cdot}86$
Group IV.	$+4{\cdot}58\,\alpha$	$+6{\cdot}15\,\alpha'$	$+0{\cdot}17\,z$	$=+1{\cdot}31$	or	$+1{\cdot}48 + 6{\cdot}02\,dL$
	$+6{\cdot}15$	$+8{\cdot}95$	$-1{\cdot}79$	$=+2{\cdot}50$		$+2{\cdot}75 + 8{\cdot}78$
	$+0{\cdot}17$	$-1{\cdot}79$	$+8{\cdot}93$	$=-2{\cdot}11$		$-2{\cdot}52 - 1{\cdot}57$
Group V.	$+6{\cdot}69\,\alpha$	$-2{\cdot}05\,\alpha'$	$+0{\cdot}02\,z$	$=-0{\cdot}28$	or	$-0{\cdot}35 - 4{\cdot}35\,dL$
	$-2{\cdot}05$	$+9{\cdot}49$	$+3{\cdot}32$	$=+1{\cdot}20$		$+1{\cdot}36 + 0{\cdot}37$
	$+0{\cdot}02$	$+3{\cdot}32$	$+11{\cdot}51$	$=+0{\cdot}42$		$+0{\cdot}40 - 0{\cdot}11$
Group VI.	$+20{\cdot}79\,\alpha$	$-1{\cdot}95\,\alpha'$	$-3{\cdot}11\,z$	$=+1{\cdot}26$	or	$+0{\cdot}91 - 19{\cdot}88\,dL$
	$-1{\cdot}95$	$+12{\cdot}70$	$-2{\cdot}75$	$=+1{\cdot}35$		$+1{\cdot}55 - 3{\cdot}73$
	$-3{\cdot}11$	$-2{\cdot}75$	$+19{\cdot}73$	$=+0{\cdot}06$		$+0{\cdot}04 + 4{\cdot}66$
Group VII.	$+11{\cdot}87\,\alpha$	$+1{\cdot}18\,\alpha'$	$+0{\cdot}13\,z$	$=-0{\cdot}13$	or	$-0{\cdot}15 + 0{\cdot}79\,dL$
	$+1{\cdot}18$	$+16{\cdot}35$	$-4{\cdot}04$	$=+2{\cdot}39$		$+2{\cdot}60 - 4{\cdot}57$
	$+0{\cdot}13$	$-4{\cdot}04$	$+15{\cdot}99$	$=-0{\cdot}37$		$-0{\cdot}21 + 4{\cdot}38$

The position-angles from Group IV., similarly treated, furnish the following normal equations :—

Group IV. Position-Angles.	$+4{\cdot}32\,\alpha$	$-2{\cdot}12\,\alpha'$	$+1{\cdot}75\,z$	$=+0{\cdot}76$	or	$+0{\cdot}76 + 2{\cdot}46\,dL$
	$-2{\cdot}12$	$+6{\cdot}78$	$-1{\cdot}83$	$=-0{\cdot}07$		$-0{\cdot}07 - 1{\cdot}98$
	$+1{\cdot}75$	$-1{\cdot}83$	$+4{\cdot}56$	$=+0{\cdot}99$		$+0{\cdot}99 + 0{\cdot}25$

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These normals from the position-angles of Group IV. have been added separately because they are necessary for determining α and α' in group IV., where otherwise only z can be determined.

The values of α and α' derived from each group are then as follows:—

Group.		I. Without personal terms.	II. With personal terms.			Weight.
		"	"			
	I.	$\alpha_{I.} = +$ 0·042	or + 0·034	− 0·414 z	− 0·910 dL	11·36
	II.	$\alpha_{II.} = -$ ·074	− ·076	− ·529	− ·074	9·90
	III.	$\alpha_{III.} = +$ ·018	+ ·020	− ·283	+ ·956	11·26
Including position-angles.	IV.	$\alpha_{IV.} = +$ ·184	+ ·223	− ·362	+ ·728	7·86
	V.	$\alpha_{V.} = -$ ·004	− ·010	− ·118	− ·683	6·25
	VI.	$\alpha_{VI.} = +$ ·072	+ ·056	+ ·173	− ·998	20·49
	VII.	$\alpha_{VII.} = -$ ·026	− ·029	− ·036	+ ·094	11·77
		"	"			
	I.	$\alpha'_{I.} = +$ 0·135	or + 0·160	+ 0·489 z	− 0·470 dL	10·38
	II.	$\alpha'_{II.} = +$ ·084	+ ·101	+ ·180	− ·135	13·32
	III.	$\alpha'_{III.} = +$ ·091	+ ·094	− ·231	+ ·340	12·41
Including position-angles.	IV.	$\alpha'_{IV.} = +$ ·107	+ ·113	+ ·323	+ ·498	13·91
	V.	$\alpha'_{V.} = +$ ·126	+ ·141	− ·375	− ·109	8·86
	VI.	$\alpha'_{VI.} = +$ ·117	+ ·131	+ ·243	− ·447	12·52
	VII.	$\alpha'_{VII.} = +$ ·148	+ ·161	+ ·250	− ·286	16·23

If the errors of the ephemeris had been capable of exact representation in terms of $\alpha + \beta\frac{t}{10} + \gamma\frac{t^2}{100}$, if the star places had been connected by heliometer triangulation and the ephemeris had been computed with the same precautions as the final ephemeris of *Victoria*, then the values of $\alpha_{I.}$, $\alpha_{II.}$, $\alpha_{III.}$, &c., should (with probable values of z and dL) have been identical within limits indicated by their probable errors, as also should the values of α'. But as none of these conditions are fulfilled, and as the period covered by the observations embraces only $1\frac{1}{2}$ revolutions of the Moon about the Earth, it is impossible to separate satisfactorily the errors which depend on the lunar equation from the empiric corrections of the ephemeris which have been developed in powers of the time.

The far better agreement *inter se* of the values of α', compared with that of the separate values of α, points to a more accurate determination of the places of the comparison stars in Declination than in Right Ascension, and probably also to greater accidental errors of the ephemeris in the latter co-ordinate.

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The suspicion of the latter circumstance would have led to the preparation of another ephemeris, had that been necessary, for definitive computation of the parallax; but, as this latter requires only a knowledge of the planet's motion for periods not exceeding two days, the present ephemeris is amply sufficient for our purpose.

Even if it only be assumed that a and a' may, for the above reasons, be considered different for each group, we can derive very approximate values of z by determining it with its weight from the preceding normal equations of each group. The results are :—

	Solution. I.	Solution. II.		Weight.
From Group I.	$z = -0''\cdot062$	or $-0''\cdot057$	$+0\cdot051\ dL$	9·05
II.	$-\ \cdot012$	$-\ \cdot022$	$-\ \cdot062$	12·85
III.	$-\ \cdot046$	$-\ \cdot059$	$-\ \cdot012$	14·80
IV.	$+\ \cdot001$	$-\ \cdot115$	$+\ \cdot079$	3·04
V.	$+\ \cdot000$	$-\ \cdot007$	$+\ \cdot026$	10·26
VI.	$+\ \cdot033$	$+\ \cdot031$	$+\ \cdot017$	18·53
VII.	$+\ \cdot015$	$+\ \cdot030$	$+\ \cdot214$	14·98
Mean, having regard to weights.	$z = -0\cdot0066$	or $-0\cdot0128$	$+0\cdot04\ dL$	83·51

The corresponding values of π are :—

From Group I.	$\pi = 8''\cdot746$	or $8''\cdot750$	$+0\cdot045\ dL$	11·2
II.	·789	·781	$-\ \cdot055$	16·6
III.	·760	·749	$-\ \cdot009$	19·1
IV.	·799	·700	$+\ \cdot070$	3·9
V.	·780	·794	$+\ \cdot022$	13·2
VI.	·829	·827	$+\ \cdot015$	23·9
VII.	·813	·826	$+\ \cdot188$	19·3
Mean, having regard to weights.	$\pi = 8\cdot792$	or $8\cdot789$	$+0\cdot04\ dL$	107·2

When the squares of the residuals in the original equations are multiplied by their respective weights we obtain :—

	Solution I.	Solution II.
$[p\ vv] =$	4·7406 or	4·3479
whence $\frac{[p\ vv]}{n-m} =$	0·0551 or	0·0506
and the mean error of an observation of weight 1 $=$	$\pm\ 0''\cdot235$ or	$\pm\ 0''\cdot225$

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For the different observers we have :—

—	Mean value of $p\,vv$.		No. of Residuals.
	I.	II.	
Gill	0·0374	0·0395	33
Elkin.....	·0461	·0379	13
Hall	·0520	·0502	14
Peter.....	·0629	·0570	19
Schur	·0635	·0393	9
Ambronn	·0177	·0189	4
Hartwig	·1697	·1690	2

The previously adopted weights would, therefore, seem to require to be multiplied by factors differing in some cases considerably from unity in order to reduce them to weights corresponding to $\epsilon^2 = 0{\cdot}0400$. The number of observations by Ambronn and Hartwig is, however, not sufficient to establish the factor, and the original weights are retained for these observers.

The weights so modified would be applicable to a re-discussion of the value of z, when the errors of the star places enter into the result, and all the observations of double distances are used. But if, as is now proposed, we employ for the definitive solution only those observations in which the same pair of stars is observed in opposite hemispheres, and where, therefore, the effect of error of the star places is eliminated, the weights of the equations are very sensibly raised.

The error thus eliminated may be approximately assumed

$$\epsilon_s = \frac{0''{\cdot}10}{\sqrt{2}}$$

because the absolute place of the planet rests on the mean of two star places, the mean error of each of which is

$$\pm\ 0''{\cdot}10 \quad (\textit{See}\ \text{page 61.})$$

The accidental error of measurement, apart from error of the stars' places, is therefore

$$\epsilon_m = \sqrt{\epsilon^2 - \epsilon_s^2}$$

where

$$\epsilon^2 = \frac{0{\cdot}04}{p_1},$$

p_1 being the originally adopted weight multiplied by the corresponding factor from the following table :—

Gill	1·058	Schur	0·631
Elkin	0·870	Ambronn	1·000
Hall	0·759	Hartwig	1·000
Peter	0·646		

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These factors represent the results of Solution I., and, if they are correct, the true weight of any of the equations from the double distances will be :—

$$P = \frac{0{\cdot}04}{\epsilon m} = \frac{1}{\frac{1}{p_1} - 0{\cdot}125}$$

In combining only those equations where the same stars have been observed in opposite hemispheres, it will be found that in each combination the factors of α, α', β, β', γ and γ' are nearly identical. As the errors of the determinations of these constants are very small, and as the computed values of these constants are to be substituted in the original equations, we may regard the sums of the equivalents of the terms in $\Delta\alpha$, $\Delta\beta$. $\Delta\alpha'$, $\Delta\beta'$, $\Delta\gamma$ and $\Delta\gamma'$ as practically insensible, and insert in their place a term s to denote the error of the equation due to the combined effect of the accidental error of observation and the errors of the two star-places. That is to say, our equations have the simple form

$$s + f'''z = n - f_l\, dL$$

where s may be regarded as a constant for each group, f''' the existing factor of z, and n is the residual from the first solution (neglecting the equivalents of terms in z and dL). As in the first discussion, we shall form two absolute terms for each equation—

I., in which the equivalents of α, α', &c., are taken from Solution I., and the personal terms G, E, H, &c., are neglected.

II., in which the equivalents of α, α', &c., are taken from Solution II., and the equivalents of G, E, H, &c., are substituted.

The resulting equations are given in the following table. These equations include the symbolical term depending on $\frac{ds}{dt}$ for Dr. Peter's observations. (*See* pp. 463 and 465).

Comparison Stars.	Place and Date of Observation.		Group and Set.	Resulting Equations. I. Without personal terms.	Resulting Equations. II. With personal terms.	Weight.
		Sept. d.				
$\zeta\ \mu$	Cape	18·43	I. 1	$s + 0{\cdot}87\,z = -0{\cdot}167$	or $-0{\cdot}170 - 1{\cdot}02\,dL$	1·51
	"	19·44	3	$s + {\cdot}85 = -{\cdot}204$	$-{\cdot}203 - 1{\cdot}05$	1·88
	Leip.	18·67	10	$s - {\cdot}71 = +{\cdot}138$	$+{\cdot}131 - 1{\cdot}03 \quad -0{\cdot}63\,p$	1·71
	Gött.	18·70	15	$s - {\cdot}77 = -{\cdot}026$	$-{\cdot}027 - 1{\cdot}02$	2·10
$\varepsilon\ \lambda$	Cape	18·65	I. 2	$s - 0{\cdot}86\,z = -0{\cdot}210$	$-0{\cdot}221 - 0{\cdot}31\,dL$	1·51
	Yale	19·65	5	$s + {\cdot}72 = +{\cdot}088$	$+{\cdot}083 - 0{\cdot}24$	0·80
	Leip.	18·39	9	$s + {\cdot}81 = -{\cdot}034$	$-{\cdot}053 - 0{\cdot}33 \quad -0{\cdot}20\,p$	2·11
	"	20·38	11	$s + {\cdot}84 = +{\cdot}070$	$+{\cdot}058 - 0{\cdot}18 \quad +0{\cdot}09\,p$	1·26
	Gött.	18·42	14	$s + {\cdot}77 = -{\cdot}005$	$-{\cdot}018 - 0{\cdot}33$	2·85

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Comparison Stars.	Place and Date of Observation.		Group and Set.	Resulting Equations. I. Without personal terms.	II. With personal terms.	Weight.
		Sept. d.				
ζ κ	Cape	22·43	I. 4	$s + 0{\cdot}81\,z = -0{\cdot}027$	or $-0{\cdot}007 - 0{\cdot}86\,dL$	2·29
	Leip.	20·65	12	$s - {\cdot}63 = +{\cdot}222$	$+{\cdot}214 - 1{\cdot}05 - 0{\cdot}66\,p$	1·54
α κ	Cape	23·41	II. 1	$s + 0{\cdot}87\,z = +0{\cdot}077$	$+0{\cdot}075 - 0{\cdot}69\,dL$	1·51
	,,	24·42	3	$s + {\cdot}86 = +{\cdot}162$	$+{\cdot}157 - 0{\cdot}51$	1·51
	,,	25·41	4	$s + {\cdot}86 = -{\cdot}352$	$-{\cdot}351 - 0{\cdot}26$	1·88
	Yale	23·94	10	$s - {\cdot}84 = -{\cdot}066$	$-{\cdot}076 - 0{\cdot}59$	0·53
	Leip.	23·65	15	$s - {\cdot}70 = +{\cdot}360$	$+{\cdot}355 - 0{\cdot}66 - 0{\cdot}72\,p$	0·71
α θ	Cape	26·41	II. 6	$s + 0{\cdot}82\,z = +0{\cdot}022$	$+0{\cdot}006 + 0{\cdot}04\,dL$	2·29
	Yale	26·93	11	$s - {\cdot}84 = -{\cdot}113$	$-{\cdot}112 + 0{\cdot}19$	0·80
γ ι†	Cape	23·65	II. 2	$s - 0{\cdot}91\,z = +0{\cdot}029$	$+0{\cdot}025 + 0{\cdot}05\,dL$	1·88
	Yale	23·63	9	$s + {\cdot}75 = -{\cdot}231$	$-{\cdot}240 + 0{\cdot}05$	0·73
	Leip.	23·38	14	$s + {\cdot}84 = +{\cdot}069$	$+{\cdot}070 + 0{\cdot}02 - 0{\cdot}17\,p$	2·30
	Gött.	23·42	18	$s + {\cdot}77 = -{\cdot}141$	$-{\cdot}146 + 0{\cdot}02$	2·85
γ η	Cape	26·62	II. 7	$s - 0{\cdot}82\,z = +0{\cdot}065$	$+0{\cdot}078 + 0{\cdot}23\,dL$	1·51
	Yale	27·61	12	$s + {\cdot}65 = +{\cdot}405$	$+{\cdot}422 + 0{\cdot}16$	0·95
	Leip.	26·34	17	$s + {\cdot}81 = -{\cdot}217$	$-{\cdot}209 + 0{\cdot}24 + 0{\cdot}47\,p$	0·71
α ζ	Cape	27·40	II. 8	$s + 0{\cdot}89\,z = -0{\cdot}226$	$-0{\cdot}233 + 0{\cdot}22\,dL$	2·29
	Yale	27·91	13	$s - {\cdot}80 = -{\cdot}388$	$-{\cdot}326 + 0{\cdot}38$	1·92
z δ	Cape	28·64	III. 1	$s - 0{\cdot}89\,z = +0{\cdot}128$	$+0{\cdot}123 + 0{\cdot}50\,dL$	2·29
	Yale	28·61	7	$s + {\cdot}79 = -{\cdot}082$	$-{\cdot}124 + 0{\cdot}48$	1·64
		Oct.				
y* α	Cape	1·40	III. 4	$s + 0{\cdot}87\,z = +0{\cdot}098$	$+0{\cdot}054 + 0{\cdot}88\,dL$	6·67
	Yale	1·88	9	$s - {\cdot}73 = +{\cdot}022$	$+{\cdot}011 + 0{\cdot}89$	1·64
u η	Cape	1·61	III. 5	$s - 0{\cdot}85\,z = -0{\cdot}062$	$-0{\cdot}047 + 0{\cdot}63\,dL$	1·51
	,,	2·61	6	$s - {\cdot}85 = -{\cdot}014$	$+{\cdot}002 + 0{\cdot}53$	2·99
	Yale	2·59	10	$s + {\cdot}82 = -{\cdot}285$	$-{\cdot}257 + 0{\cdot}53$	1·92
		Sept.				
	Leip.	30·35	12	$s + {\cdot}74 = +{\cdot}341$	$+{\cdot}349 + 0{\cdot}62 - 0{\cdot}12\,p$	1·26
	Gött.	30·43	13	$s + {\cdot}64 = +{\cdot}111$	$+{\cdot}121 + 0{\cdot}62$	2·85
		Oct.				
t x	Cape	5·38	IV. 4	$s + 0{\cdot}87\,z = -0{\cdot}028$	$-0{\cdot}093 + 0{\cdot}84\,dL$	4·50
	,,	6·39	5	$s + {\cdot}85 = -{\cdot}149$	$-{\cdot}133 + 0{\cdot}64$	4·50
	Yale	5·59	11	$s + {\cdot}03 = -{\cdot}252$	$-{\cdot}331 + 0{\cdot}81$	0·41
	Gött.	6·64	20	$s - {\cdot}82 = -{\cdot}050$	$+{\cdot}146 + 0{\cdot}59$	1·30

† The observation of *Sappho* with the stars γ ι at Leipzig on September 24 is rejected, because of the unfavourable conditions and delay which produced great dissymmetry in the observation.

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Comparison Stars.	Place and Date of Observation.		Group and Set.	Resulting Equations. I. Without personal terms.		II. With personal terms.		Weight.
		Oct. d.			″	″		
l x	Cape	10·36	V. 1	$s + 0{\cdot}87\,z$	$= -0{\cdot}124$ or	$+ 0{\cdot}116 - 0{\cdot}30\,dL$		2·99
	Yale	10·87	7	$s - {\cdot}82$	$= - {\cdot}314$	$- {\cdot}310 - 0{\cdot}42$		0·33
m v	Cape	10·56	V. 2	$s - 0{\cdot}84\,z$	$= - 0{\cdot}062$	$- 0{\cdot}066 - 0{\cdot}37\,dL$		3·70
	Yale	10·57	6	$s + {\cdot}83$	$= - {\cdot}072$	$- {\cdot}108 - 0{\cdot}37$		1·34
i w	Cape	12·36	V. 3	$s + 0{\cdot}75\,z$	$= + 0{\cdot}014$	$+ 0{\cdot}011 - 0{\cdot}82\,dL$		2·99
	Gött.	12·70	9	$s - {\cdot}87$	$= - {\cdot}301$	$- {\cdot}279 - 0{\cdot}88$		0·70
m s	Cape	12·57	V. 4	$s - 0{\cdot}84\,z$	$= + 0{\cdot}018$	$+ 0{\cdot}022 - 0{\cdot}13\,dL$		2·99
	Leip.	12·30	8	$s + {\cdot}86$	$= - {\cdot}120$	$- {\cdot}112 - 0{\cdot}13$	$+ 0{\cdot}49\,p$	2·11
f s	Cape	14·55	VI. 2	$s - 0{\cdot}81\,z$	$= - 0{\cdot}155$	$- 0{\cdot}161 - 0{\cdot}54\,dL$		2·99
	„	15·55	3	$s - {\cdot}80$	$= - {\cdot}093$	$- {\cdot}101 - 0{\cdot}58$		2·99
	Yale	15·57	6	$s + {\cdot}78$	$= - {\cdot}173$	$- {\cdot}186 - 0{\cdot}58$		0·66
	Gött.	15·37	16	$s + {\cdot}72$	$= + {\cdot}188$	$+ {\cdot}163 - 0{\cdot}57$		1·30
h o	Cape	18·35	VI. 4	$s + 0{\cdot}81\,z$	$= + 0{\cdot}035$	$+ 0{\cdot}018 - 0{\cdot}90\,dL$		4·50
	Yale	18·85	12	$s - {\cdot}80$	$= - {\cdot}127$	$- {\cdot}127 - 0{\cdot}82$		1·17
e r	Cape	18·54	VI. 5	$s - 0{\cdot}79\,z$	$= + 0{\cdot}016$	$+ 0{\cdot}005 - 0{\cdot}39\,dL$		4·44
	Yale	17·55	10	$s + {\cdot}80$	$= + {\cdot}081$	$+ {\cdot}080 - 0{\cdot}52$		0·66
	„	18·55	11	$s + {\cdot}81$	$= - {\cdot}174$	$- {\cdot}173 - 0{\cdot}40$		1·34
d o	Cape	19·34	VII. 1	$s + 0{\cdot}82\,z$	$= - 0{\cdot}074$	$- 0{\cdot}092 - 0{\cdot}83\,dL$		3·70
	Yale	19·82	7	$s - {\cdot}75$	$= + {\cdot}281$	$+ {\cdot}249 - 0{\cdot}74$		0·70
	„	21·81	9	$s - {\cdot}73$	$= - {\cdot}224$	$- {\cdot}199 - 0{\cdot}35$		1·34
	Gött.	21·54	17	$s - {\cdot}71$	$= - {\cdot}109$	$- {\cdot}088 - 0{\cdot}42$		1·30
	Bamb.	19·61	20	$s - {\cdot}85$	$= + {\cdot}057$	$+ {\cdot}049 - 0{\cdot}79$		4·61
c n	Cape	21·54	VII. 2	$s - 0{\cdot}81\,z$	$= - 0{\cdot}318$	$- 0{\cdot}335 + 0{\cdot}02\,dL$		3·70
	Yale	21·61	8	$s + {\cdot}61$	$= - {\cdot}074$	$- {\cdot}082 + 0{\cdot}04$		0·73
	„	23·56	10	$s + {\cdot}73$	$= + {\cdot}112$	$+ {\cdot}083 + 0{\cdot}22$		0·66
	Leip.	23·28	12	$s + {\cdot}86$	$= + {\cdot}219$	$+ {\cdot}185 + 0{\cdot}19$	$+ 0{\cdot}16\,p$	0·71
c g	Cape	24·54	VII. 4	$s - 0{\cdot}76\,z$	$= + 0{\cdot}144$	$+ 0{\cdot}098 + 0{\cdot}11\,dL$		3·70
	Leip.	24·29	13	$s + {\cdot}79$	$= - {\cdot}017$	$- {\cdot}049 + 0{\cdot}12$	$+ 0{\cdot}58\,p$	1·89
a h	Cape	27·34	VII. 6	$s + {\cdot}75\,z$	$= + 0{\cdot}018$	$+ 0{\cdot}026 + 0{\cdot}81\,dL$		3·70
	Leip.	26·56	14	$s - {\cdot}78$	$= + {\cdot}138$	$+ {\cdot}142 + 0{\cdot}70$	$- 0{\cdot}81\,p$	0·71

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Having regard to the weights, the resulting values of z, derived by the method of least squares, are :—

Group.		Solution. I.		Solution. II.			Weight.
		″		″			
I.	ζ μ	$z = -$ 0·144	or	− 0·143	− 0·008 dL	+ 0·169 p	4·61
	ε λ	= + ·132		+ ·131	+ ·011	− ·028	3·39
	ζ κ	= − ·173		− ·153	+ ·132	+ ·458	1·90
II.	α κ	$z = -$ 0·139		− 0·135	+ 0·094 dL	+ 0·242 p	2·61
	α θ	= + ·082		+ ·069	− ·090		1·62
	γ ι	= − ·050		− ·051	− ·016	− ·043	4·15
	γ η	= + ·026		+ ·026	− ·021	+ ·146	1·89
	α ζ	= + ·096		+ ·056	− ·095		2·99
III.	ε δ	$z = -$ 0·125		− 0·147	− 0·011 dL		2·69
	y* α	= + ·048		+ ·027	− ·006		3·37
	u η	= + ·028		+ ·029	+ ·015	− 0·016 p	6·39
IV.	t x	$z = -$ 0·008		− 0·128	+ 0·080 dL		3·35
V.	l x	$z = +$ 0·260		+ 0·254	+ 0·068 dL		0·85
	m v	= − ·006		− ·025	− ·001		2·75
	i w	= + ·194		+ ·179	+ ·038		1·49
	m s	= − ·081		− ·079	± ·000	+ 0·288 p	3·57
VI.	f s	$z = +$ 0·122		+ 0·112	− 0·008 dL		3·52
	h o	= + ·100		+ ·090	− ·051		2·40
	e r	= − ·067		− ·060	− ·030		3·53
VII.	d o	$z = -$ 0·053		− 0·063	− 0·097 dL		6·64
	c n	= + ·268		+ ·263	+ ·086	+ 0·040 p	3·20
	c g	= − ·107		− ·097	+ ·004	+ ·374	3·00
	a h	= − ·078		− ·076	+ ·072	+ ·528	1·40

Or taken in groups we have :—

Group.	I.		II.			Weight.
	″		″			
I.	$z = -$ 0·0549	or	− 0·0512	+ 0·0256 dL	+ 0·157 p	9·91
II.	= − ·0077		− ·0179	− ·0219	+ ·055	13·25
III.	= + ·0005		− ·0098	+ ·0035	− ·008	12·45
IV.	= − ·0080		+ ·1278	+ ·0798		3·35
V.	= + ·0235		+ ·0153	+ ·0128	+ ·119	8·66
VI.	= + ·0458		+ ·0421	− ·0273		9·45
VII.	= + ·0055		+ ·0018	− ·0179	+ ·140	14·24

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Having regard to the weights, the mean gives—

$$z = +0''\cdot0007 \text{ (I.) or } +0''\cdot0016 \text{ (II.)} \; -0\cdot0017\, dL \; +0\cdot0729\, p$$

The effect of any possible error in the adopted value of the lunar equation is therefore without sensible influence on the value of z.

If we adopt, from p. 522, the value of p, viz., $+0''\cdot1568$, we have—

	I. Without personal corrections.	II. With personal corrections.	Weight.
$z =$	$+0''\cdot0007$	$+0''\cdot0130$	71·31
$\frac{[p\,vv]}{n-1} =$	0·0403	0·0348	

In examining the separate results, one is struck in the case of the combination IV_{tx} by the large difference in the value of z when computed with and without personal corrections. The greater part of this difference arises from the large factor and value of s in equation IV_{20}, the stars t and x being comparatively near to the planet, and one of the distances more than double that of the other. Dr. Schur notes that one observation (No. 34) was made without the prism, and "stars scarcely visible—cirrus cloud"; these conditions may have affected his usual habit of pointing. Besides this the star t is a double star (mags. 8·2 and 9·3, $s = 0''\cdot9$, $p = 175°$)—and this circumstance alone renders it doubtful if the pointings were made in the same manner by different observers. The observations referred to the stars t x (that is to say, all the effective observations of Group IV.) are therefore rejected.

The other values of z agree with the mean, within such limits as might be expected from their weights, except the combination c n in Group VII., where the residual amounts to $0''\cdot25$ with the weight 3·20. There is only one observation at the Cape in this combination—that of October 21—and Gill notes "Images excessively faint—conditions only equivalent to 4; furious south-easter blowing." At Leipzig the measures were hurried and unsymmetrical. A weight of 0·80 (*i.e.*, one-fourth of its original weight) has therefore been assigned to this combination.

We then have:—

Without personal corrections.	With personal corrections.	Weight.
$z = -0''\cdot0087$	$-0''\cdot0022$	65·55

and

	I. Without personal corrections.		II. With personal corrections.
$\frac{[p\,vv]}{n-1} =$	$0''\cdot0338$	or	$0''\cdot0251$

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whence the probable error of z is

	Without personal corrections.		With personal corrections.
	$\pm$ 0″·0151	or	$\pm$ 0″·0130
and the probable error of π	$\pm$ 0·0133	or	$\pm$ 0·0114

That the personal corrections, derived from the discussion of *Victoria*, do sensibly improve the agreement of the results is thus evident, and we accept the results so corrected as definitive.

Divided into groups we have finally :—

Group.		Weight.
I.	z = —0″·0266	9·91
II.	= — ·0093	13·25
III.	= — ·0111	12·45
V.	= + ·0340	8·66
VI.	= + ·0421	9·45
VII.	= — ·0261	11·83

Mean, as above

		Weight.
z	= — 0″·0022	65·55
$\frac{[p\,vv]}{n-1}$	= 0·008841	

and the probable error of z = $\pm$ 0″·0077

whence

$$\pi = 8''\cdot7981 \text{ with the probable error } \pm\ 0''\cdot0068.$$

It would thus appear that combination in groups has a tendency to eliminate systematic error. Such grouping of pairs in which personality depending on $\frac{ds}{dt}$ has a different effect on the parallax, must, in fact, tend to such elimination ; but the number of groups is too small to permit definite conclusions on the subject. It is preferable, therefore, not to under-estimate the probable error, but to adopt for the definitive result the probable error $\pm$ 0″·0114 derived from the 22 separate combinations, rather than $\pm$ 0″·0068 derived from the six separate groups.

We have thus finally

$$\pi = \mathbf{8''\cdot7981}$$

with the probable error $\pm$ **0″·0114**.

We cannot apply to the observations of *Sappho* the same test as to the *Victoria* results, viz., to determine the value of π from the Cape observations alone. The considerable meridian zenith-distance of *Sappho*, both at the northern observatories and the Cape, renders the parallax factors in Right Ascension very unfavourable. Besides

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this, the same comparison stars were not used for the morning and evening observations, and it was not possible to arrange for their connection by heliometer-triangulation.

Under these circumstances I have deduced the parallax by combining the observations of each northern observatory, separately, with the corresponding observations at the Cape.

Employing the same weights as in the last discussion we have :—

SEPARATE VALUES OF z.

CAPE and YALE.				CAPE and LEIPZIG.				
—	I. Without per. corr.	II. With per. corr.	Weight.	—	I. Without per. corr.	II. With personal corrections.		Weight.
	″	″			″	″		
ε λ	+0·189	+0·193	1·30	ζ μ	—0·208	—0·204	+0·402 *p*	2·81
α κ	+ ·004	+ ·011	1·39	ε λ	+ ·128	+ ·125	— ·053	2·95
α θ	+ ·082	+ ·069	1·62	ζ κ	— ·173	— ·153	+ ·132	1·90
γ ι	— ·156	— ·159	1·44	α κ	— ·268	— ·264	+ ·462	1·51
γ η	+ ·230	+ ·234	1·26	γ ι	+ ·023	+ ·026	— ·097	3·17
α ζ	+ ·096	+ ·056	2·99	γ η	— ·173	— ·176	+ ·288	1·29
z δ	— ·125	— ·147	2·69	u η	+ ·233	+ ·228	— ·075	2·49
y* α	+ ·048	+ ·027	3·37	m s	— ·081	— ·079	·000	3·57
u η	— ·153	— ·145	3·77	c n	+ ·324	+ ·315	+ ·096	0·42
l x	+ ·260	+ ·254	0·85	c g	— ·107	— ·097	+ ·374	3·00
m v	— ·006	— ·025	2·75	a h	— ·078	— ·076	+ ·528	1·40
f s	— ·032	— ·035	1·49					
h o	+ ·100	+ ·090	2·40					
e r	— ·067	— ·060	3·53					
d o	— ·016	— ·031	3·19					
c n	+ ·230	+ ·229	0·55					

CAPE and GÖTTINGEN.				CAPE and BAMBERG.			
—	I. Without per. corr.	II. With per. corr.	Weight.	—	I. Without per. corr.	II. With per. corr.	Weight.
	″	″			″	″	
ζ μ	— 0·098	— 0·099	3·45	d o	— 0·079	— 0·085	5·72
ε λ	+ ·126	+ ·125	2·63				
γ ι	— ·101	— ·102	3·20				
u η	+ ·095	+ ·091	3·88				
i w	+ ·194	+ ·179	1·49				
f s	+ ·204	+ ·193	2·48				
d o	+ ·023	— ·003	2·25				

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The resulting mean values of z are :—

—	I.	II.	Weight of z.
	″	″	
Cape and Yale	+ 0·0065	− 0·0034	34·59
Cape and Leipzig	− ·0445	− ·0416 + 0·218 p	24·49
Cape and Göttingen	+ ·0456	+ ·0390	19·38
Cape and Bamberg	− ·079	− ·085	5·72

The probable error of each result is to be determined from the internal agreement of each series within itself. We have then for the values of $\frac{[pvv]}{n-1}$:—

—	I.	II. Excluding p.	II. Including p.	No. of separate results.
Cape and Yale	0·0301	0·0307		16
Cape and Leipzig	·0570	·0541	0·0390	11
Cape and Göttingen	·0437	·0419		7
	εε	εε		
Assumed for weight = 1 Cape and Bamberg	·0400	·0400		1

The considerable improvement in the accuracy of the Cape-Leipzig result by the introduction of the term p, depending on $\frac{ds}{dt}$ as derived from the *Victoria* observations, is worthy of note.

The resulting values and probable errors of π are :—

—	I. Without personal corrections.		II. With personal corrections.		—
	π	Prob. error.	π	Prob. error.	
	″	″	″	″	
Cape and Yale	8·806	± 0·020	8·797	± 0·020	
Cape and Leipzig	·761	± ·029	·793	± ·026	
Cape and Göttingen	·840	± ·032	·834	± ·031	
Cape and Bamberg	·731	± ·056	·725	± ·056	From observations on one night only.

Of course, any combination of this kind for the definitive value of the parallax is quite inadmissible, as, in some cases, the same Cape observations would be used three times over.

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The final result from the *Sappho* observations must be regarded as that derived at p. 80, viz. :—

$$8''\cdot7981$$

with the probable error

$$\pm\ 0''\cdot0114$$

where each observation enters into the result with its proper weight.

But it is at least satisfactory to find that the values of the parallax as derived separately from the observations of each northern observatory combined with the corresponding observations at the Cape, agree within limits of their probable errors.

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VOL. I., PART 4.

DISCUSSION

OF THE

OBSERVATIONS OF IRIS,

BY

W. L. ELKIN.

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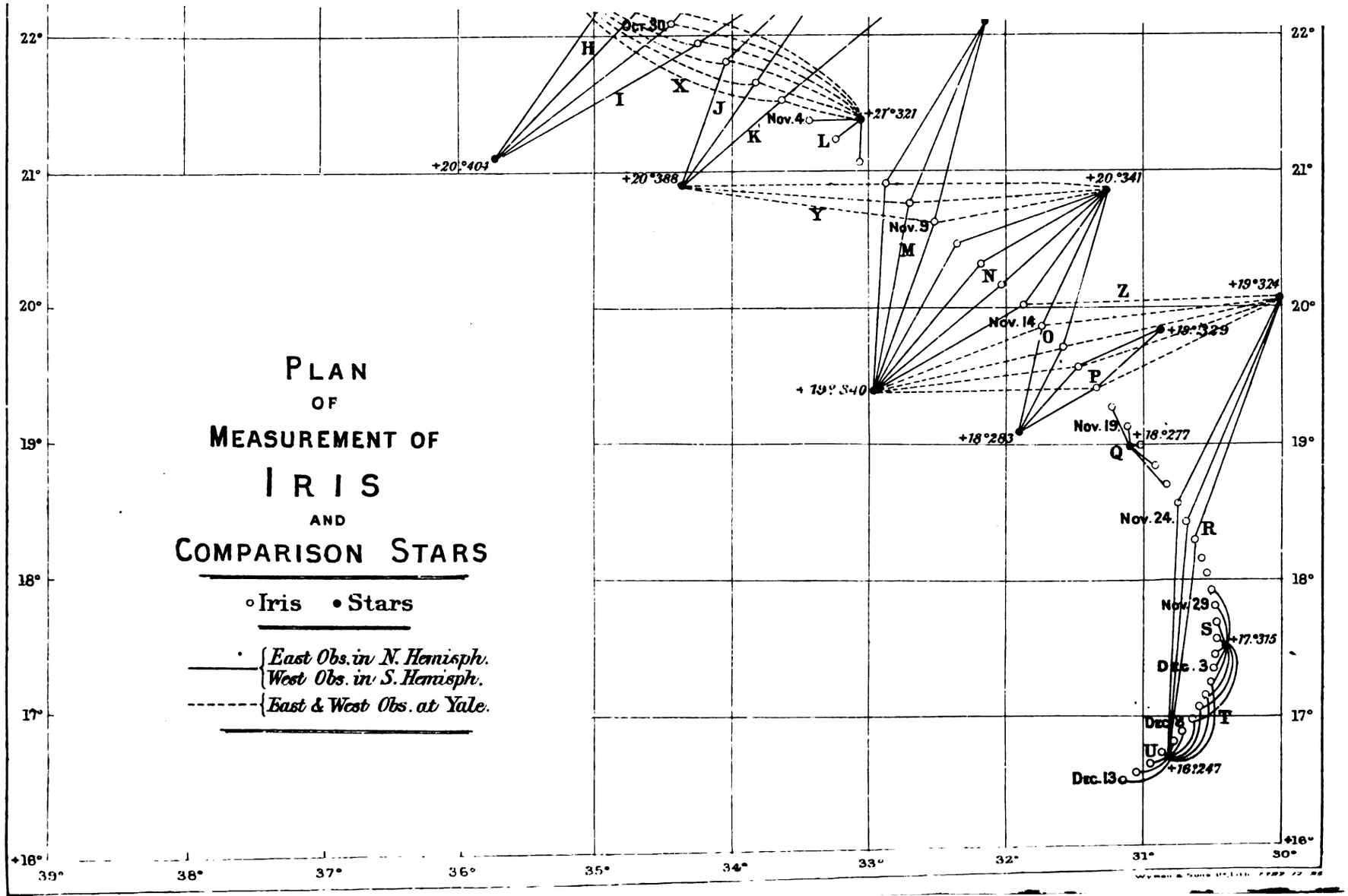
PLAN
OF
MEASUREMENT OF
IRIS
AND
COMPARISON STARS
○ Iris • Stars
East Obs. in N. Hemisph.
West Obs. in S. Hemisph.
East & West Obs. at Yale.
Oct. 30
Nov. 4
Nov. 9
Nov. 14
Nov. 19
Nov. 24
Nov. 29
Dec. 3
Dec. 8
Dec. 13
+21°321
+20°404
+20°388
+20°341
+19°324
+19°329
+19°340
+18°283
+18°277
+17°315
+16°247
H
I
X
J
K
L
Y
M
N
Z
O
P
Q
R
S
T
U
22°
21°
20°
19°
18°
17°
+16°
39°
38°
37°
36°
35°
34°
33°
32°
31°
30°

DISCUSSION OF THE OBSERVATIONS OF IRIS.

1.—Introductory.

The Iris series was planned originally in the expectation that the Cape and Yale heliometers would be the only co-operating instruments, and that but one set of observations could be undertaken on each evening at each observatory. Under these conditions the strongest determination of the parallax of the planet could undoubtedly be secured by distance measures between it and two comparison stars, situated in position-angles of about 135° and 315°, and at as nearly equal distances as possible. These distances were to be measured at a western hour-angle of about three hours at the Cape, and at an eastern hour-angle of about three hours at Yale. At these hour-angles the line joining the stars would be nearly vertical at both observatories, and hence the maximum parallax factor in the direction of measurement would be obtained without going beyond 75° in zenith distance. Furthermore, as the difference of longitude of the two observatories is about six hours, the measures would be nearly simultaneous, and the place of the planet could be eliminated almost perfectly from the parallax result. These double-distances were to be observed so that the scale-value could be taken as identical for both stars, and thus easily eliminated. For a number of nights, however, no pairs of stars answering the requirements of position and brilliancy were found, it having been decided not to go below the magnitude 8·5, unless exceptionally, and for these, if a star was found near the planet its distance and position-angle were to be observed, the reduction constants for scale-value and index-error to be derived from a pair of standard stars measured at the same sitting.

This plan was modified to some extent by the co-operation of the heliometers at Leipzig and at the Radcliffe Observatory at Oxford, which necessitated the abandonment of the principle of using only absolutely simultaneous observations, and added to by undertaking a series at western hour-angles at Yale. This latter was formed on those nights when a single star was used for locating the planet, by re-observing the distances and position-angles at western hour-angles ; but on the remaining nights when the pair of stars in position-angles 135° and 315° would have given a very small parallax factor west of the meridian, a second pair lying nearly along the parallel was selected and observed both evening and morning. This latter series was undertaken by Dr. A. Hall, Jr.

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The accompanying chart (Plate V.) shows the plan finally adopted, it having been considered advisable to retain the same set of comparison stars, or star, for as many nights as possible, and the groups of measures from any one star or pair of stars are designated by the letters A, B, &c. The following table contains the result of the amount of observations secured, arranged in their several groups. In the columns headed by the names of the observatories, the numbers designate the number of measures, each of four pointings, secured in distance (s) and position-angle (p). Thus, on October 10, four measures in distance and in position-angle were obtained both evening and morning at Yale from the comparison star $+ 24^{\circ}\cdot376$; on October 14, four measures in distance were secured from each of the comparison stars $+24^{\circ}\cdot369$ and $+22^{\circ}\cdot375$ at the Cape. It will be seen that 1,107 measures in all of the planet and comparison stars were obtained, of which, however, 103 were not available for the parallax deduction, for reasons which will appear later on (all enclosed in parentheses ( ) in the table), leaving 1,004 available measures for the discussion in groups.

I have thought it desirable, however, to carry out a discussion as nearly on the original plan of simultaneous measures as possible, and have formed the observations into "combinations" which satisfy this condition as far as possible. These combinations are indicated in the last column of the table, and it will be seen that 862 measures can be included in such combinations, those not available being enclosed in brackets [ ].

Group.	Date, 1888.	Comparison Stars.	Cape.	Leipzig.	Oxford.	Yale, Evening.	Yale, Morning.	Combination.
A	Oct. 10	$+ 24^{\circ}\cdot376$	...	...	...	4s., 4p.	4s., 4p.	I.
	11	"	...	...	...	4s., 4p.	...	
	12	"	[1s., —]	...	...	...	...	
	13	"	(1s., 1p.)	...	...	..	...	
B	14	$+ 24^{\circ}\cdot369 + 22^{\circ}\cdot375$	(4s., 4s.)	...	...	...	...	
C	15	$+ 22^{\circ}\cdot372 + 24^{\circ}\cdot358$	2s., 2s.	...	...	4s., 4s.	...	XVII.
	16	" "	...	...	...	[6s., 6s.]	...	
	17	" "	...	...	...	[8s., 8s.]	...	
	18	" "	...	[4s., 4s.]	...	[8s., 8s.]	...	
	19	" "	...	...	...	...	...	
D	20	$+ 22^{\circ}\cdot368 + 23^{\circ}\cdot326$	...	...	...	...	...	
	21	" "	6s., 6s.	...	...	8s., 8s.	...	XVIII.

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Group.	Date, 1888.	Comparison Stars.	Cape.	Leipzig.	Oxford.	Yale, Evening.	Yale, Morning.	Combination.
E	Oct. 22	+ 22°·354	[—, 4p.]	...	...	...	...	
	23	,,	...	...	...	...	...	
	24	,,	2s., 4p.	2s., 2p.	...	6s., 6p.	8s., 8p.	II.
F	25	+ 22°·354 + 22°·347	4s., 4s.	2s. 2p., 2s. 2p.	...	4s. 4p., 4s. 4p.	3s. 3p., 3s. 3p.	XIX.
G	26	+ 22°·347	4s., 1p.	2s., 2p.	...	...	...	III.
	27	,,	[2s., —]	...	...	...	...	
H	28	+ 22°·331 + 20°·404	...	[4s., 4s.]	...	[6s., 6s.]	...	
	29	,, ,,	1s., 1s.	...	...	6s., 6s.	...	XX.
	30	,, ,,	4s., 4s.	...	2s., 2s.	6s., 6s.	...	XXI.
I	31	+ 22°·329 + 20°·404	3s., 3s.	...	...	6s., 6s.	...	XXII.
J	Nov. 1	+ 22°·329 + 20°·388	...	...	...	[6s., 6s.]	...	
	2	,, ,,	4s., 4s.	...	...	4s., 4s.	...	XXIII.
K	3	+ 21°·317 + 20°·388	2s., 2s.	...	...	8s., 8s.	...	XXIV.
L	4	+ 21°·321	[—, 2p.]	...	...	...	...	
	5	,,	10s., —	2s., 2p.	...	...	...	IV.
	6	,,	[4s., —]	...	...	...	...	
M	7	+ 21°·304 + 19°·340	6s., 6s.	2s., 2s.	...	8s., 8s.	...	} XXV.
	8	,, ,,	...	4s., 4s.	...	...	...	
	9	,, ,,	3s., 2s.	4s., 4s.	...	...	...	XXVI.
N	10	+ 20°·341 + 19°·340	4s., 4s.	3s., 3s.	...	...	4s., 4s.	XXVII.
	11	,, ,,	2s., 2s.	4s., 4s.	...	8s., 8s.	4s., 4s.	XXVIII.
	12	,, ,,	5s., 5s.	4s., 4s.	...	6s., 6s.	4s., 4s.	XXIX.
	13	,, ,,	4s., 4s.	(1s., 1s.)	2s., 2s.	6s., 6s.	...	XXX.
O	14	+ 18°·283 + 20°·341	...	(4s., 4s.)	...	(8s., 8s.)	...	
	15	,, ,,	...	(4s., 4s.)	...	...	...	

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Group.	Date. 1888.	Comparison Stars.	Cape.	Leipzig.	Oxford.	Yale, Evening.	Yale, Morning.	Combination.
P	Nov. 16	+ 18°·283 + 19°·329	...	...	(2s., 2s.)	...	...	
	17	" "	...	(3s., 3s.)	...	(8s., 8s.)	..	
Q	18	+ 18°·277	2s., 2p.	2s.. 2p.	...	...	...	V.
	19	"	[4s., 2p.]	...	...	...	...	
	20	"	6s., 8p.	...	2s., 2p.	6s., 6p.	4s., 4p.	VI.
	21	"	(—, 1p.)	...	...	4s., 4p.	4s., 4p.	VII.
	22	"	4s., 2p.	...	...	6s., 6p.	4s., 4p.	VIII.
R	23	+ 19°·324 + 16°·247	2s., 2s.	...	...	2s., 2s.	...	XXXI.
	24	" "	[2s., 2s.]	...	...	...	...	
	25	" "	...	...	...	...	...	
S	28	+ 17°·315	—, 6p.	...	...	...	...	IX.
	29	"	4s., 4p.	2s., 2p.	...	...	...	
	30	"	4s., —	...	...	4s., 4p.	...	X.
	Dec. 1	"	...	...	...	4s., 4p.	4s., 4p.	XI.
	2	"	6s., 6p.	...	...	4s., 4p.	4s., 4p.	XII.
	3	"	7s., —	2s., 2p.	...	...	...	XIII.
	4	"	...	...	...	4s., 4p.	...	
	5	"	...	[2s., 2p.]	...	...	...	
T	4	+ 17°·315 + 16°·247	[2s., 2s.]	...	...	...	...	
	5	" "	4s., 4s.	...	...	...	...	XXXII.
	6	" "	1s., 1s.	4s., 4s.	...	...	...	
	7	" "	4s., 4s.	3s., 3s.	...	...	...	XXXIII.
U	6	+ 16°·247	...	...	(2s., 2p.)	4s., 4p.	4s., 4p.	XIV.
	7	"	...	...	...	...	...	
	8	"	4s., —	2s., 2p.	...	...	...	XV.
	9	"	[5s., —]	...	(2s., 2p.)	...	...	
	10	"	[6s., 8p.]	...	...	...	...	
	11	"	...	...	...	...	...	
	12	"	...	...	...	4s., 4p.	2s., 2p.	XVI.
	13	"	...	2s., 2p.	...	4s., 4p.	(4s., 4p.)	

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Group.	Date, 1888.	Comparison Stars.	Cape.	Leipzig.	Oxford.	Yale, Evening.	Yale, Morning.	Combination.
		° °						
W	Oct 16	+ 24·776 + 22·354	...	...	...	(2s., 2s.)	...	
	17	" "	...	...	...	4s., 4s.	4s., 4s.	XXXIV.
	18	" "	...	...	...	4s., 4s.	4s., 4s.	XXXV.
	19	" "	...	...	...	...	...	
	20	" "	...	...	...	...	4s., 4s.	XXXVI.
	21	" "	...	...	...	4s., 4s.	4s., 4s.	
		° °						
X	29	+ 22·347 + 21·321	...	...	...	4s., 4s.	4s., 4s.	XXXVII.
	30	" "	...	...	...	4s., 4s.	4s., 4s.	XXXVIII.
	31	" "	...	...	...	4s., 4s.	2s., 1s.	XXXIX.
	Nov. 1	" "	...	..	...	2s., 2s.	4s., 4s.	XL.
	2	" "	...	...	...	...	...	
	3	" "	...	...	...	[4s., 4s.]	(4s., —)	
		° °						
Y	7	+ 20·388 + 20·341	...	...	...	(4s., 4s.)	...	
	8	" "	...	...	...	...	...	
	9	" "	...	...	...	...	...	
		° °						
Z	13	+ 19·340 + 19·324	...	...	...	4s., 4s.	4s., 4s.	XLI.
	14	" "	...	...	...	4s., 4s.	...	
	15	" "	...	...	...	...	...	
	16	" "	...	...	...	...	4s., 4s.	XLII.
	17	" "	...	...	...	4s., 4s.	4s., 4s.	
Total No. of measures secured		1107	264	140	24	472	207	
" " available for discussion in groups ...		1004	253	116	12	428	195	
" " available for discussion in simultaneous combinations ...		862	207	96	12	352	195	

2.—Meridian Observations of the Comparison Stars.

The thirty stars we had included in the programme for comparison with Iris were most kindly observed on the meridian at nine of the principal observatories. The results of the original observations and their discussion by Dr. Auwers, are given in vol. II. The star places adopted for computation of the tabular distances and position-angles of Iris are, however, the result of a discussion of the meridian observations in which the following corrections were derived and applied to the results of the various observatories.

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Reductions in R.A. to a Mean System.

Magnitude.	Leipzig.	Pulkowa.	Greenwich.	Berlin.	Dunsink.	Oxford.	Cape.	Leiden.	Melbourne.
	s	s	s	s	s	s	s	s	s
5·5	− 0·021	+ 0·030	+ 0·030	+ 0·015	+ 0·022	− 0·043	− 0·045	− 0·008	+ 0·020
6·0	− 30	+ 30	+ 25	+ 11	+ 17	− 34	− 37	− 7	+ 24
6·5	− 36	+ 30	+ 16	+ 8	+ 12	− 27	− 27	− 4	+ 30
7·0	− 41	+ 28	+ 6	+ 6	+ 8	− 25	− 17	0	+ 38
7·5	− 45	+ 25	− 5	+ 5	+ 6	− 24	− 6	+ 4	+ 47
8·0	− 48	+ 20	− 19	+ 6	+ 5	− 25	+ 6	+ 10	+ 56
8·5	− 49	+ 10	− 50	+ 11	+ 4	− 28	+ 23	+ 18	+ 66
	″	″	″	″	″	″	″	″	″
Reduction in Declination.	+ 0·11	+ 0·35	+ 0·79	+ 0·39	− 0·03	− 0·65	− 0·55	+ 0·06	− 0·44

The resulting adopted mean places of the stars are given in Section 6. The differences from the values deduced in Dr. Auwers' exhaustive discussion are as follows, after allowing for the common difference :—

$$A-E = -0{\cdot}016^{\text{sec.}}\ (-0''{\cdot}24)^{\Delta\alpha} \text{ and } -0''{\cdot}44^{\Delta\delta}.$$

Star—BD.		Auwers — Elkin. Δα	Auwers — Elkin. Δδ	Star—BD.		Auwers — Elkin. Δα	Auwers — Elkin. Δδ	Star—BD.		Auwers — Elkin. Δα	Auwers — Elkin. Δδ
	°	″	″		°	″	″		°	″	″
β or +	22·375	+0·01	+0·08	s or +	22·347	−0·04	−0·03	i or +	18·283	+0·09	−0·08
α	24·376	− ·13	+ ·08	r′	24·347	+ ·20	− ·29	h	20·348	+ ·11	+ ·01
z	22·372	− ·02	+ ·02	r	20·388	− ·15	+ ·02	g	21·298	− ·12	+ ·15
y	22·368	+ ·02	+ ·07	q	22·331	− ·13	+ ·05	f	20·341	+ ·06	− ·04
x	24·369	+ ·02	+ ·01	p	19·346	− ·03	− ·12	e	18·277	+ ·12	+ ·07
w′	21·349	− ·19	− ·09	o	22·329	+ ·06	+ ·04	d	19·329	− ·03	− ·02
w	24·358	+ ·09	− ·06	n	21·321	− ·01	− ·08	c	16·247	− ·05	− ·07
v	20·404	·00	·00	m	19·340	+ ·14	+ ·13	b	17·315	+ ·18	− ·01
u	22·354	+ ·03	+ ·03	l	21·317	− ·23	·00	a	19·324	− ·07	− ·01
t	23·326	− ·14	+ ·07	k	21·304	+ ·03	·00	a′	17·307	+ ·12	− ·04

Since, in the method of reduction employed for the Iris series, small changes in the adopted star places have no influence on the resulting parallax, it has not been thought necessary to make use of these corrections, which were not available until after the computations of the present paper were completed.

The epoch of the meridian observations is so nearly coincident with that of the heliometer comparisons that no appreciable correction for proper motion is requisite, even if that should amount to 0″·30 per annum, which is not the case for any of the stars.

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3.—Ephemeris of Iris.

The approximate ephemeris of Iris, kindly furnished by the Berlin *Jahrbuch* Office, was only computed to 0″·1, and hence not sufficiently accurate for our purpose. It served, however, for the formation of three normal places derived from the comparison with the meridian observations of Iris available at the time. From these positions Dr. A. Hall, Jr., computed the following system of elements :—

	°	′	″		
L =	32	22	7·36	Oct. 1·5	Berlin.
π =	42	34	13·26	1888·0	
☊ =	259	47	18·38		
i =	5	29	13·44		
ϕ =	13	20	51·62		
μ =			963·2904		
log a =	0·3774995				

From these elements an ephemeris was computed by Mr. E. P. Austin for every day from September 16 to December 22, the period of the meridian observations of the planet, which is found in the subsequent pages. It was derived by using the co-ordinates of the Sun of the American Ephemeris for 1888·0, and applying to the places thus found the precession and nutation given by the star constants of the same ephemeris, and the aberration deduced with the daily motions from the ephemeris and the light-time 497ˢ·8. The places do not contain the planetary perturbations, as it was the intention to only use this ephemeris for deriving normal places and applying the perturbations to these. The special perturbations of the rectangular co-ordinates have been computed for Venus, Earth, Mars, Jupiter and Saturn, and are given in the subjoined table, in units of the 7th decimal, together with their effect in R.A. and Dec., the osculation epoch being November 7·5.

Date.	Δx	Δy	Δz	$\Delta \alpha$	$\Delta \delta$
1888				″	″
Sept. 13·5	− 17·8	+ 46·8	+ 18·8	+ 0·99	+ 0·22
23·5	− 13·7	+ 35·1	+ 12·9	+ 0·81	+ 0·16
Oct. 3·5	− 9·7	+ 22·0	+ 8·0	+ 0·56	+ 0·10
13·5	− 5·6	+ 11·5	+ 4·1	+ 0·31	+ 0·06
23·5	− 2·2	+ 4·1	+ 1·4	+ 0·12	+ 0·02
Nov. 2·5	− 0·3	+ 0·5	+ 0·2	+ 0·01	0·00
12·5	− 0·3	+ 0·4	+ 0·2	+ 0·01	0·00
22·5	− 2·4	+ 3·9	+ 1·5	+ 0·11	+ 0·03
Dec. 2·5	− 6·3	+ 10·6	+ 4·0	+ 0·28	+ 0·08
12·5	− 11·2	+ 20·3	+ 7·7	+ 0·48	+ 0·15
22·5	− 15·8	+ 33·2	+ 12·8	+ 0·71	+ 0·21

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Greenwich Mean Time.	Apparent Right Ascension.				Apparent Declination.				Log. Distance.	
1888	° ′ ″	′ ″	″	″	° ′ ″	′ ″	″	″		
Sept. 16·5	38 32 23·22	+ 4 54·01	− 31·82		+24 3 31·88	+ 2 59·21	− 13·47		0·02069	
17	37 17·23	+ 4 22·19	− 32·10	−0·28	6 31·09	+ 2 45·74	− 13·73	−0·26	0·01738	− 331
18	41 39·42	+ 3 50·09	− 32·28	−0·18	9 16·83	+ 2 32·01	− 14·03	−0·30	0·01410	− 328
19	45 29·51	+ 3 17·81	− 32·64	−0·36	11 48·84	+ 2 17·98	− 14·24	−0·21	0·01084	− 326
20	48 47·32	+ 2 45·17	− 32·78	−0·14	14 6·82	+ 2 3·74	− 14·49	−0·25	0·00760	− 324
21	51 32·49	+ 2 12·39	− 32·97	−0·19	16 10·56	+ 1 49·25	− 14·68	−0·19	0·00440	− 320
22	53 44·88	+ 1 39·42	− 33·17	−0·20	17 59·81	+ 1 34·57	− 14·95	−0·27	0·00123	− 317
23	55 24·30	+ 1 6·25	− 33·41	−0·24	19 34·38	+ 1 19·62	− 15·22	−0·27	9·99810	− 313
24	56 30·55	+ 0 32·84	− 33·47	−0·06	20 54·00	+ 1 4·40	− 15·51	−0·29	9·99499	− 311
25	57 3·39	− 0 0·63	− 33·55	−0·08	21 58·40	+ 0 48·89	− 15·78	−0·27	9·99192	− 307
26	57 2·76	− 0 34·18	− 33·56	−0·01	22 47·29	+ 0 33·11	− 15·98	−0·20	9·98890	− 302
27	56 28·58	− 1 7·74	− 33·56	0·00	23 20·40	+ 0 17·13	− 16·24	−0·26	9·98592	− 298
28	55 20·84	− 1 41·30	− 33·39	+0·17	23 37·53	+ 0 0·89	− 16·69	−0·45	9·98298	− 294
29	53 39·54	− 2 14·69	− 33·21	+0·18	23 38·42	− 0 15·80	− 16·79	−0·10	9·98009	− 289
30	51 24·85	− 2 47·90	− 32·81	+0·40	23 22·62	− 0 32·59	− 16·80	−0·01	9·97724	− 285
Oct. 1	48 36·95	− 3 20·71	− 32·23	+0·58	22 50·03	− 0 49·39	− 17·06	−0·26	9·97446	− 278
2	45 16·24	− 3 52·94	− 31·94	+0·29	22 0·64	− 1 6·45	− 17·27	−0·21	9·97172	− 274
3	41 23·30	− 4 24·88	− 31·59	+0·35	20 54·19	− 1 23·72	− 17·42	−0·15	9·96905	− 267
4	36 58·42	− 4 56·47	− 30·74	+0·85	19 30·47	− 1 41·14	− 17·52	−0·10	9·96644	− 261
5	32 1·95	− 5 27·21	− 30·07	+0·67	17 49·33	− 1 58·66	− 17·49	+0·03	9·96388	− 256
6	26 34·74	− 5 57·28	− 29·29	+0·78	15 50·67	− 2 16·15	− 17·45	+0·04	9·96140	− 248
7	20 37·46	− 6 26·57	− 28·37	+0·92	13 34·52	− 2 33·70	− 17·50	−0·05	9·95899	− 241
8	14 10·89	− 6 54·94	− 27·47	+0·90	11 0·82	− 2 51·20	− 17·73	−0·23	9·95666	− 233
9	7 15·95	− 7 22·41	− 26·54	+0·93	8 9·62	− 3 8·93	− 17·42	+0·31	9·95439	− 227
10	37 59 53·54	− 7 48·95	− 25·62	+0·92	5 0·69	− 3 26·35	− 17·49	−0·07	9·95220	− 219
11	52 4·59	− 8 14·57	− 24·63	+0·99	1 34·34	− 3 43·84	− 17·39	+0·10	9·95009	− 211
12	43 50·02	− 8 39·20	− 23·42	+1·21	23 57 50·50	− 4 1·23	− 17·18	+0·21	9·94806	− 203
13	35 10·82	− 9 2·62	− 22·13	+1·29	53 49·27	− 4 18·41	− 17·03	+0·15	9·94613	− 193
14	26 8·20	− 9 24·75	− 21·02	+1·11	49 30·86	− 4 35·44	− 16·87	+0·16	9·94427	− 186
15	16 43·45	− 9 45·77	− 19·84	+1·18	44 55·42	− 4 52·31	− 16·67	+0·20	9·94251	− 176
16	6 57·68	−10 5·61	− 18·46	+1·38	40 3·11	− 5 8·98	− 16·39	+0·28	9·94084	− 167
17	36 56 52·07	−10 24·07	− 17·07	+1·39	34 54·13	− 5 25·37	− 16·06	+0·33	9·93925	− 159
18	46 28·00	−10 41·14	− 15·72	+1·35	29 28·76	− 5 41·43	− 15·80	+0·26	9·93778	− 147
19	35 46·86	−10 56·86	− 14·38	+1·34	23 47·33	− 5 57·23	− 15·43	+0·37	9·93639	− 139
20	24 50·00	−11 11·24	− 12·82	+1·56	17 50·10	− 6 12·66	− 15·00	+0·43	9·93511	− 128
21	13 38·76	−11 24·06	− 11·36	+1·46	11 37·44	− 6 27·66	− 14·58	+0·42	9·93393	− 118
22	2 14·70	−11 35·42	− 9·88	+1·48	5 9·78	− 6 42·24	− 14·11	+0·47	9·93285	− 108
23	35 50 39·28	−11 45·30	− 8·30	+1·58	22 58 27·54	− 6 56·35	− 13·67	+0·44	9·93188	− 97
24	38 53·98	−11 53·60	− 6·69	+1·61	51 31·19	− 7 10·02	− 13·22	+0·45	9·93101	− 87
25	27 0·38	−12 0·29	− 5·07	+1·62	44 21·17	− 7 23·24	− 12·64	+0·58	9·93026	− 75
26	15 0·09	−12 5·36	− 3·32	+1·75	36 57·93	− 7 35·88	− 11·86	+0·78	9·92962	− 64
27	2 54·73	−12 8·68	− 1·56	+1·76	29 22·05	− 7 47·74	− 11·21	+0·65	9·92908	− 54
28	34 50 46·05	−12 10·24	+ 0·25	+1·81	21 34·31	− 7 58·95	− 10·63	+0·58	9·92867	− 41
29	38 35·81	−12 9·99	+ 2·12	+1·87	13 35·36	− 8 9·58	− 9·89	+0·74	9·92836	− 31
30	26 25·82	−12 7·87	+ 3·88	+1·76	5 25·78	− 8 19·47	− 9·06	+0·83	9·92817	− 19
31	14 17·95	−12 3·99	+ 5·70	+1·82	21 57 6·31	− 8 28·53	− 8·21	+0·85	9·92810	− 7
Nov. 1	2 13·96	−11 58·29	+ 7·46	+1·76	48 37·78	− 8 36·74	− 7·38	+0·83	9·92814	+ 4
2	33 50 15·67	−11 50·83	+ 9·09	+1·63	40 1·04	− 8 44·12	− 6·49	+0·89	9·92829	+ 15
3·5	38 24·84	−11 41·74	+ 10·77	+1·68	31 16·92	− 8 50·61	− 5·59	+0·90	9·92856	+ 27
										+ 39

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Greenwich Mean Time.	Apparent Right Ascension.				Apparent Declination.				Log. Distance.	
1888	° ′ ″	′ ″	″	″	° ′ ″	′ ″	″	″		
Nov. 4·5	33 26 43·10	−11 30·97	+ 12·62	+1·85	+21 22 26·31	− 8 56·20	− 4·68	+0·91	9·92895	+ 50
5	15 12·13	−11 18·35	+ 14·23	+1·61	13 30·11	− 9 0·88	− 3·76	+0·92	9·92945	+ 62
6	3 53·78	−11 4·12	+ 15·75	+1·52	4 29·23	− 9 4·64	− 2·87	+0·89	9·93007	+ 73
7	32 52 49·66	−10 48·37	+ 17·29	+1·54	20 55 24·59	− 9 7·51	− 1·98	+0·89	9·93080	+ 84
8	42 1·29	−10 31·08	+ 18·72	+1·43	46 17·08	− 9 9·49	− 1·05	+0·93	9·93164	+ 95
9	31 30·21	−10 12·36	+ 20·00	+1·28	37 7·59	− 9 10·54	− 0·07	+0·98	9·93259	+ 107
10	21 17·85	− 9 52·36	+ 21·26	+1·26	27 57·05	− 9 10·61	+ 0·73	+0·80	9·93366	+ 117
11	11 25·49	− 9 31·10	+ 22·41	+1·15	18 46·44	− 9 9·88	+ 1·57	+0·84	9·93483	+ 127
12	1 54·39	− 9 8·69	+ 23·48	+1·07	9 36·56	− 9 8·31	+ 2·42	+0·85	9·93610	+ 139
13	31 52 45·70	− 8 45·21	+ 24·66	+1·18	0 28·25	− 9 5·89	+ 3·21	+0·79	9·93749	+ 148
14	44 0·49	− 8 20·55	+ 25·58	+0·92	19 51 22·36	− 9 2·68	+ 4·02	+0·81	9·93897	+ 158
15	35 39·94	− 7 54·97	+ 26·50	+0·92	42 19·68	− 8 58·66	+ 4·84	+0·82	9·94055	+ 163
16	27 44·97	− 7 28·47	+ 27·42	+0·92	33 21·02	− 8 53·82	+ 5·50	+0·66	9·94223	+ 178
17	20 16·50	− 7 1·05	+ 27·97	+0·55	24 27·20	− 8 48·32	+ 6·24	+0·74	9·94401	+ 187
18	13 15·45	− 6 33·08	+ 28·78	+0·81	15 38·88	− 8 42·08	+ 6·92	+0·68	9·94588	+ 197
19	6 42·37	− 5 4·30	+ 29·75	+0·97	6 56·80	− 8 35·16	+ 7·59	+0·67	9·94785	+ 203
20	0 38·07	− 5 34·55	+ 30·01	+0·26	18 58 21·64	− 8 27·57	+ 8·19	+0·60	9·94988	+ 213
21	30 55 3·52	− 5 4·54	+ 30·49	+0·48	49 54·07	− 8 19·38	+ 8·77	+0·58	9·95201	+ 223
22	49 58·98	− 4 34·05	+ 30·96	+0·47	41 34·69	− 8 10·61	+ 9·32	+0·55	9·95424	+ 229
23	45 24·93	− 4 3·09	+ 31·52	+0·56	33 24·08	− 8 1·29	+ 9·83	+0·51	9·95653	+ 238
24	41 21·84	− 3 31·57	+ 32·16	+0·64	25 22·79	− 7 51·46	+ 10·34	+0·51	9·95891	+ 245
25	37 50·27	− 2 59·41	+ 32·50	+0·34	17 31·33	− 7 41·12	+ 10·88	+0·54	9·96136	+ 253
26	34 50·86	− 2 26·91	+ 32·86	+0·36	9 50·21	− 7 30·24	+ 11·38	+0·50	9·96389	+ 260
27	32 23·95	− 1 54·05	+ 33·04	+0·18	2 19·97	− 7 18·86	+ 11·85	+0·47	9·96649	+ 267
28	30 29·90	− 1 21·01	+ 33·56	+0·52	17 55 1·11	− 7 7·01	+ 12·16	+0·31	9·96916	+ 273
29	29 8·89	− 0 47·45	+ 33·66	+0·10	47 54·10	− 6 54·85	+ 12·61	+0·45	9·97189	+ 280
30	28 21·44	− 0 13·79	+ 33·74	+0·08	40 59·25	− 6 42·24	+ 12·91	+0·30	9·97469	+ 286
Dec. 1	28 7·65	+ 0 19·95	+ 33·97	+0·23	34 17·01	− 6 29·33	+ 13·30	+0·39	9·97755	+ 292
2	28 27·60	+ 0 53·92	+ 33·93	−0·04	27 47·68	− 6 16·03	+ 13·60	+0·30	9·98047	+ 297
3	29 21·52	+ 1 27·85	+ 33·82	−0·11	21 31·65	− 6 2·43	+ 13·73	+0·13	9·98344	+ 302
4	30 49·37	+ 2 1·67	+ 33·67	−0·15	15 29·22	− 5 48·70	+ 13·88	+0·15	9·98646	+ 307
5	32 51·04	+ 2 35·34	+ 33·74	+0·07	9 40·52	− 5 34·82	+ 14·11	+0·23	9·98953	+ 313
6	35 26·38	+ 3 9·08	+ 33·54	−0·20	4 5·70	− 5 20·71	+ 14·25	+0·14	9·99266	+ 316
7	38 35·46	+ 3 42·62	+ 33·31	−0·23	16 58 44·99	− 5 6·46	+ 14·41	+0·16	9·99582	+ 320
8	42 18·08	+ 4 15·93	+ 33·05	−0·26	53 38·53	− 4 52·05	+ 14·36	−0·05	9·99902	+ 325
9	46 34·01	+ 4 48·98	+ 32·95	−0·10	48 46·48	− 4 37·69	+ 14·40	+0·04	0·00227	+ 327
10	51 22·99	+ 5 21·93	+ 32·33	−0·62	44 8·79	− 4 23·29	+ 14·47	+0·07	0·00554	+ 331
11	56 44·92	+ 5 54·26	+ 32·08	−0·25	39 45·50	− 4 8·82	+ 14·40	−0·07	0·00885	+ 336
12	31 2 39·18	+ 6 26·34	+ 31·78	−0·30	35 36·68	− 3 54·42	+ 14·38	−0·02	0·01221	+ 337
13	9 5·52	+ 6 58·12	+ 31·51	−0·27	31 42·26	− 3 40·04	+ 14·38	0·00	0·01558	+ 340
14	16 3·64	+ 7 29·63	+ 30·99	−0·52	28 2·22	− 3 25·66	+ 14·19	−0·19	0·01898	+ 343
15	23 33·27	+ 8 0·62	+ 30·46	−0·53	24 36·56	− 3 11·47	+ 14·04	−0·15	0·02241	+ 345
16	31 33·89	+ 8 31·08	+ 30·22	−0·24	21 25·09	− 2 57·43	+ 13·90	−0·14	0·02586	+ 347
17	40 4·97	+ 9 1·30	+ 29·55	−0·67	18 27·66	− 2 43·53	+ 13·80	−0·10	0·02933	+ 350
18	49 6·27	+ 9 30·85	+ 29·15	−0·40	15 44·13	− 2 29·73	+ 13·66	−0·14	0·03283	+ 351
19	58 37·12	+10 0·00	+ 29·02	−0·13	13 14·40	− 2 16·07	+ 13·47	−0·19	0·03634	+ 352
20	32 8 37·12	+10 29·02	+ 28·47	−0·55	10 58·33	− 2 2·60	+ 13·29	−0·18	0·03986	+ 355
21	19 6·14	+10 57·49			8 55·73	− 1 49·31			0·04341	+ 355
22·5	30 3·63				7 6·42				0·04696	

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4.—Meridian Observations of Iris.

The meridian observations of the planet, which were made in conjunction with those of the comparison stars from September 16 to December 22, are contained in the tables of the following pages, and with them the corrections which they furnish to the preceding ephemeris. These have been found by assuming the systematic corrections for each observatory to be those for a star of magnitude 7·0, as deduced in Section 2, the theoretical magnitude of the planet during this period being from 6·7 to 7·3. As throughout, the solar parallax has been taken for these comparisons = 8″·80; the longitude and geocentric latitude and radius for the several observatories were taken from the Berlin *Jahrbuch*. The column "Curve Resid." contains the residuals left by the systematic correction to the ephemeris deduced in the following section.

1888. G. M. T.		Observed R.A.	Eph. Corr.	Curve Resid.	Observed Dec.	Eph. Corr.	Curve Resid.
		h m s	″	″	° ′ ″	″	″
September 16·64	Dunsink	2 34 12·35	+ 3·22	...	+ 24 3 53·4	+ 0·54	...
20·57	Leipzig	2 35 16·15	+ 1·25	...	24 14 13·9	+ 1·67	...
21·57	Leipzig	2 35 26·89	+ 0·06	...	24 16 15·5	+ 0·89	...
21·59	Leiden	2 35 26·960	− 1·60	...	24 16 17·71	+ 0·63	...
22·52	Pulkowa	2 35 35·31	+ 3·18	...	24 17 56·52	+ 0·34	...
22·57	Leipzig	2 35 35·59	+ 0·64	...	24 18 2·6	+ 0·05	...
22·59	Leiden	2 35 35·654	− 0·26	...	24 18 5·82	+ 1·12	...
25·51	Pulkowa	2 35 48·20	− 0·12	...	24 21 54·63	+ 1·21	...
25·58	Leiden	2 35 48·221	− 1·28	...	24 21 58·84	+ 0·11	...
26·56	Leipzig	2 35 48·16	+ 0·06	...	24 22 45·5	+ 0·10	...
26·61	Dunsink	2 35 47·89	− 2·21	...	24 22 46·2	− 1·13	...
27·50	Pulkowa	2 35 45·80	− 0·94	...	24 23 15·18	+ 0·26	...
27·55	Leipzig	2 35 45·69	− 1·06	...	24 23 17·7	+ 0·18	...
27·58	Leiden	2 35 45·509	− 2·01	...	24 23 17·72	− 0·27	...
28·50	Pulkowa	2 35 41·30	− 0·82	...	24 23 31·33	− 0·60	...
30·50	Pulkowa	2 35 25·56	− 1·71	...	24 23 17·86	+ 0·81	...
30·55	Leipzig	2 35 25·12	− 1·80	...	24 23 17·6	+ 0·36	...
October 1·54	Leipzig	2 35 13·92	− 0·94	...	24 22 45·2	+ 1·22	...
1·56	Leiden	2 35 13·521	− 2·23	...	24 22 42·65	− 0·34	...
1·59	Dunsink	2 35 13·05	− 3·56	...	24 22 41·9	+ 0·26	...
2·49	Pulkowa	2 35 1·21	+ 0·11	...	24 21 56·45	+ 0·97	...
3·54	Leipzig	2 34 44·94	− 0·70	...	24 20 47·3	+ 0·22	...
3·59	Dunsink (*a*) ..	2 34 43·99	[− 1·19]	...	...	...	...
4·48	Pulkowa	2 34 28·05	− 1·77	...	24 19 25·50	− 0·62	...
4·59	Dunsink	2 34 26·21	− 1·05	...	24 19 18·5	+ 0·55	...
5·48	Pulkowa	2 34 8·38	− 1·77	...	24 17 45·42	− 0·14	...
5·53	Leipzig	2 34 7·45	− 1·25	...	24 17 42·8	+ 1·25	...
6·48	Pulkowa	2 33 46·66	− 2·01	...	24 15 47·78	+ 0·19	...

(*a*) Only 2 wires. Appeared for only a few seconds through clouds.

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1888. G. M. T.			Observed R.A.	Eph. Corr.	Curve Resid.	Observed Dec.	Eph. Corr.	Curve Resid.
			h m s	s	s	° ′ ″	″	″
October	7·47	Pulkowa	2 33 23·02	— 1·05	...	+ 24 13 32·64	+ 0·43	...
	7·52	Leipzig	2 33 21·89	— 0·55	...	24 13 27·6	+ 1·13	...
	8·47	Pulkowa	2 32 57·38	— 1·01	...	24 11 0·00	+ 0·60	...
	9·47	Pulkowa	2 32 29·73	— 2·05	— 0·99	24 8 7·28	— 1·56	— 1·97
	11·46	Pulkowa	2 31 29·42	— 0·81	+ 0·03	24 1 36·87	+ 0·60	+ 0·09
	13·54	Greenwich ...	2 30 19·19	— 1·36	— 0·76	23 53 38·89	+ 0·53	— 0·09
	13·56	Dunsink	2 30 18·64	— 0·24	+ 0·36	23 53 30·9	+ 1·00	+ 0·38
	14·55	Dunsink	2 29 42·50	— 0·14	+ 0·34	23 49 11·3	— 0·01	— 0·68
	15·48	Cape	2 29 7·64	+ 1·11	+ 1·48	23 45 10·83	+ 1·58	+ 0·37
	15·53	Greenwich ...	2 29 5·45	— 1·94	— 1·57	23 44 45·55	+ 0·63	— 0·09
	15·54	Oxford	2 29 5·35	— 1·88	— 1·52	23 44 42·22	+ 1·55	+ 0·83
	16·48	Cape	2 28 38·63	— 0·49	— 0·23	23 40 17·45	— 0·75	— 1·51
	17·53	Greenwich ...	2 27 46·37	+ 0·67	+ 0·81	23 34 46·42	+ 1·90	+ 1·08
	17·53	Oxford	2 27 46·22	+ 0·10	+ 0·24	23 34 40·54	+ 0·43	— 0·39
	18·51	Leiden	2 27 5·400	+ 0·70	+ 0·72	23 29 20·42	+ 0·61	— 0·27
	19·48	Berlin	2 26 23·809	+ 0·15	+ 0·06	23 23 48·69	+ 1·18	+ 0·25
	19·49	Leipzig	2 26 23·80	+ 1·12	+ 1·03	23 23 47·8	+ 0·79	— 0·14
	19·51	Leiden	2 26 22·796	+ 0·88	+ 0·79	23 23 39·72	+ 0·43	— 0·50
	19·52	Greenwich ...	2 26 22·22	+ 0·40	+ 0·31	23 23 39·27	+ 0·20	— 0·73
	19·52	Oxford	2 26 22·16	+ 1·30	+ 1·21	23 23 36·24	+ 1·30	+ 0·37
	20·52	Oxford	2 25 38·46	+ 0·88	+ 0·67	23 17 40·93	+ 2·90	+ 1·91
	20·54	Dunsink	2 25 37·76	+ 0·23	+ 0·02	23 17 33·7	+ 1·68	+ 0·69
	22·46	Cape	2 24 10·81	— 0·08	— 0·52	23 5 36·29	+ 1·77	+ 0·68
	22·52	Oxford	2 24 8·30	— 0·14	— 0·58	23 5 2·12	+ 2·57	+ 1·47
	22·53	Dunsink	2 24 7·72	+ 1·36	+ 0·92	23 4 54·5	+ 1·36	+ 0·26
	23·51	Greenwich ...	2 23 22·26	+ 0·57	+ 0·01	22 58 25·17	+ 1·84	+ 0·69
	23·51	Oxford	2 23 22·06	— 0·46	— 1·02	22 58 21·12	+ 2·70	+ 1·55
	24·47	Berlin	2 22 37·110	+ 0·06	— 0·62	22 51 40·19	+ 0·92	— 0·28
	24·47	Leipzig	2 22 37·14	+ 1·77	+ 1·09	22 51 39·9	+ 1·34	+ 0·14
	24·48	Leiden	2 22 35·948	— 0·08	— 0·76	22 51 30·76	+ 1·54	+ 0·34
	25·46	Berlin	2 21 49·744	+ 0·58	— 0·22	22 44 31·96	+ 0·86	— 0·39
	25·47	Leipzig	2 21 49·59	— 0·45	— 1·25	22 44 31·8	+ 1·47	+ 0·22
	26·45	Cape	2 21 2·56	0·00	— 0·91	22 37 31·30	+ 0·57	— 0·73
	26·50	Greenwich ...	2 21 0·04	— 0·46	— 1·38	22 36 58·08	+ 0·28	— 1·03
	27·41	Pulkowa	2 20 15·97	+ 0·72	— 0·30	22 29 57·81	+ 1·41	+ 0·06
	27·48	Leiden	2 20 12·557	+ 1·13	+ 0·10	22 29 25·12	+ 0·29	— 1·07
	27·50	Greenwich ...	2 20 11·92	+ 0·70	— 0·33	22 29 24·50	+ 1·18	— 0·18
	28·45	Berlin	2 19 25·290	+ 0·45	— 0·69	22 21 51·29	+ 1·18	— 0·23
	28·46	Leipzig	2 19 25·26	+ 1·33	+ 0·19	22 21 49·8	+ 0·54	— 0·87
	29·44	Cape	2 18 37·63	+ 2·73	+ 1·47	22 14 16·86	+ 2·11	+ 0·64
	30·43	Cape	2 17 48·89	— 0·71	— 2·09	22 6 8·88	+ 1·45	— 0·07
	30·49	Greenwich ...	2 17 46·57	+ 2·15	+ 0·76	22 5 33·52	+ 1·30	— 0·22
	30·49	Oxford	2 17 46·35	+ 0·93	— 0·46	22 5 28·97	+ 2·13	+ 0·61

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1838. G. M. T.			Observed R.A.	Eph. Corr.	Curve Resid.	Observed Dec.	Eph. Corr.	Curve Resid.
			h m s	s	s	° ′ ″	″	″
October	30·50	Dunsink	2 17 45·70	+ 1·94	+ 0·55	+ 22 5 20·8	+ 1·79	+ 0·26
	31·43	Cape	2 17 0·80	+ 3·61	+ 2·11	21 57 52·00	+ 1·77	+ 0·19
	31·45	Leipzig	2 16 59·84	+ 1·09	— 0·41	21 57 28·1	+ 0·64	— 0·94
November	1·39	Pulkowa	2 16 14·16	+ 2·96	+ 1·35	21 49 26·58	+ 1·62	— 0·01
	1·43	Cape	2 16 12·47	+ 0·60	— 1·01	21 49 25·43	+ 1·47	— 0·16
	1·44	Leipzig	2 16 11·79	+ 2·20	+ 0·59	21 49 2·4	+ 1·36	— 0·27
	2·39	Pulkowa	2 15 26·27	+ 1·23	— 0·49	21 40 52·20	+ 1·46	— 0·22
	2·42	Cape	2 15 24·72	+ 0·27	— 1·45	21 40 50·67	+ 0·82	— 0·87
	3·39	Pulkowa	2 14 38·90	+ 0·08	— 1·75	21 32 10·07	+ 0·99	— 0·75
	5·41	Cape	2 13 4·86	+ 1·93	— 0·09	21 14 26·35	+ 1·21	— 0·64
	5·43	Leipzig	2 13 4·17	+ 2·78	+ 0·76	21 14 3·0	+ 1·22	— 0·63
	6·41	Cape	2 12 19·78	+ 3·04	+ 0·94	21 5 26·95	+ 0·59	— 1·31
	7·41	Cape	2 11 35·42	+ 0·94	— 1·23	20 56 25·75	+ 1·99	+ 0·05
	8·42	Leipzig	2 10 51·55	+ 1·16	— 1·08	20 46 57·1	+ 2·43	+ 0·46
	9·42	Leipzig	2 10 9·59	+ 2·24	— 0·05	20 37 48·4	+ 1·28	— 0·72
	9·42	Berlin	2 10 9·593	+ 1·33	— 0·96	20 37 49·75	+ 1·69	— 0·31
	9·44	Leiden	2 10 8·616	+ 1·90	— 0·39	20 37 37·15	+ 2·13	+ 0·13
	10·41	Leipzig	2 9 28·89	+ 3·32	+ 1·00	20 28 40·9	+ 2·13	+ 0·10
	10·44	Leiden	2 9 27·881	+ 2·45	+ 0·13	20 28 28·44	+ 2·19	+ 0·16
	11·41	Berlin	2 8 49·308	+ 1·35	— 0·99	20 19 32·22	+ 1·66	— 0·38
	11·41	Leipzig	2 8 49·48	+ 4·85	+ 2·51	20 19 30·5	+ 1·01	— 1·03
	12·39	Cape	2 8 11·89	+ 3·11	+ 0·77	20 10 47·39	+ 2·75	+ 0·73
	12·41	Berlin	2 8 11·265	+ 2·00	— 0·34	20 10 24·44	+ 1·15	— 0·87
	12·41	Leipzig	2 8 11·36	+ 4·28	+ 1·94	20 10 22·4	+ 2·12	+ 0·10
	13·04	Melbourne ...	2 7 47·774	+ 1·19	— 1·14	20 4 53·56	+ 3·55	+ 1·55
	13·39	Cape	2 7 35·29	+ 3·57	+ 1·25	20 1 41·17	+ 3·36	+ 1·37
	13·44	Greenwich ...	2 7 33·33	+ 2·10	— 0·22	20 1 3·56	+ 3·30	+ 1·32
	13·44	Oxford	2 7 33·21	+ 1·71	— 0·61	20 0 55·53	+ 1·05	— 0·93
	14·39	Cape	2 7 0·23	+ 3·93	+ 1·65	19 52 37·55	+ 4·29	+ 2·34
	14·40	Berlin	2 6 59·556	+ 1·91	— 0·37	19 52 13·03	+ 1·93	— 0·01
	14·40	Leipzig	2 6 59·54	+ 1·43	— 0·85	19 52 11·6	+ 1·57	— 0·37
	16·03	Melbourne ...	2 6 5·784	+ 2·04	— 0·15	19 37 44·81	+ 1·89	+ 0·03
	16·40	Leipzig (*b*) ...	2 5 54·06	[— 2·69]	[— 4·84]	19 34 11·8	[+ 0·55]	[— 1·28]
	16·43	Oxford	2 5 53·22	+ 2·51	+ 0·36	19 33 53·13	+ 1·49	— 0·34
	16·45	Dunsink (*c*)...	2 5 52·90	[+ 4·73]	[+ 2·59]	...	...	...
	17·38	Cape	2 5 24·86	+ 2·21	+ 0·16	19 25 42·88	+ 1·46	— 0·30
	17·39	Leipzig (*d*) ...	2 5 24·44	[+ 2·93]	[+ 0·88]	19 25 20·2	[+ 1·68]	[— 0·08]
	17·43	Greenwich ...	...	...	...	19 25 6·51	+ 1·65	— 0·11
	17·43	Oxford	2 5 23·28	+ 2·31	+ 0·27	19 25 0·34	+ 1·22	— 0·54
	19·37	Cape	2 4 30·24	+ 1·65	— 0·14	19 8 14·45	+ 1·89	+ 0·32
	20·02	Melbourne ...	2 4 14·009	+ 0·37	— 1·33	19 2 39·82	+ 1·59	+ 0·08
	20·37	Cape	2 4 5·77	+ 1·60	— 0·05	18 59 39·95	+ 2·00	+ 0·53
	20·38	Berlin	2 4 5·442	+ 2·00	+ 0·35	18 59 18·57	+ 2·05	+ 0·58

(*b*) Through clouds, very uncertain ; 5 wires.
(*c*) Only 3 wires. Scarcely visible.
(*d*) Through clouds, only faintly visible in a nearly dark field ; 8 wires.

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1888. G. M. T.		Observed R.A.	Eph. Corr.	Curve Resid.	Observed Dec.	Eph. Corr.	Curve Resid.
		h m s	s	s	° ′ ″	″	″
November 20·38	Leipzig	2 4 5·39	+ 1·52	— 0·13	+ 18 59 17·1	+ 1·56	+ 0·09
20·42	Greenwich	2 4 4·64	+ 3·14	+ 1·49	18 59 4·82	+ 2·29	+ 0·82
20·44	Dunsink	2 4 4·09	+ 1·00	— 0·64	18 58 49·8	+ 0·98	— 0·49
21·42	Greenwich	2 3 42·00	— 0·53	— 2·04	18 50 37·52	+ 1·69	+ 0·32
21·42	Oxford	2 3 42·12	+ 1·93	+ 0·42	18 50 31·19	+ 0·99	— 0·38
22·01	Melbourne	2 3 29·658	+ 1·32	— 0·10	18 45 48·27	+ 1·89	+ 0·48
22·42	Oxford	2 3 21·61	+ 0·40	— 0·95	18 42 11·65	+ 0·03	— 1·24
23·36	Cape	2 3 4·18	+ 0·63	— 0·57	18 34 41·97	+ 0·76	— 0·41
24·36	Cape	2 2 47·78	+ 1·42	+ 0·38	18 26 42·17	+ 2·26	+ 1·19
25·42	Dunsink	2 2 32·47	+ 1·41	+ 0·54	18 18 3·6	+ 1·06	+ 0·10
26·00	Melbourne	2 2 24·995	— 1·64	— 2·41	18 13 49·80	+ 0·45	— 0·45
26·37	Leipzig	2 2 20·95	+ 0·72	+ 0·02	18 10 47·9	+ 2·12	+ 1·26
26·40	Greenwich	2 2 20·42	— 1·09	— 1·78	18 10 35·71	+ 0·03	— 0·83
26·40	Oxford	2 2 20·48	+ 0·22	— 0·47	18 10 30·19	+ 0·98	+ 0·12
27·35	Cape	2 2 11·09	+ 1·77	+ 1·26	18 3 37·20	+ 1·01	+ 0·24
27·40	Greenwich	2 2 10·57	+ 1·22	+ 0·72	18 3 5·12	+ 0·58	— 0·18
27·40	Oxford	2 2 10·56	+ 1·07	+ 0·57	18 3 0·93	+ 1·75	+ 0·99
27·42	Dunsink	2 2 10·34	+ 0·14	— 0·36	18 2 53·0	+ 0·94	+ 0·18
28·40	Greenwich	2 2 2·92	+ 2·49	+ 2·18	17 55 46·86	+ 1·02	+ 0·36
29·34	Cape	2 1 57·40	+ 1·25	+ 1·12	17 49 10·29	+ 1·33	+ 0·76
29·36	Leipzig	2 1 57·44	+ 2·63	+ 2·50	17 48 49·1	+ 0·44	— 0·12
29·99	Melbourne	...	...	...	17 44 38·15	— 1·34	— 1·84
30·34	Cape	2 1 53·88	+ 1·11	+ 1·18	17 42 14·17	+ 0·94	+ 0·47
30·36	Leipzig	2 1 53·92	+ 1·96	+ 2·03	17 41 54·5	+ 1·32	+ 0·85
30·39	Oxford (*e*)	2 1 53·42	[— 3·98]	[— 3·90]	17 41 38·08	[— 0·33]	[— 0·79]
30·41	Dunsink	2 1 53·65	+ 0·45	+ 0·53	17 51 31·3	— 0·50	— 0·96
December 1·35	Berlin	2 1 52·519	+ 0·30	+ 0·57	17 35 12·04	+ 1·13	+ 0·75
1·39	Oxford	2 1 52·35	— 2·65	— 2·38	17 34 56·34	+ 0·45	+ 0·07
2·98	Melbourne	2 1 55·253	+ 0·26	+ 0·83	17 24 53·54	— 1·02	— 1·28
3·33	Cape	2 1 56·67	— 0·25	+ 0·38	17 22 42·92	+ 0·77	+ 0·53
4·29	Pulkowa	2 2 1·63	— 3·72	— 2·92	17 16 37·63	+ 1·65	+ 1·47
4·34	Berlin	2 2 2·105	— 1·56	— 0·75	17 16 21·04	— 0·89	— 1·07
4·34	Leipzig	2 2 2·14	— 2·02	— 1·21	17 16 20·4	+ 1·01	+ 0·83
5·32	Cape	2 2 9·76	— 1·19	— 0·20	17 10 47·52	— 0·55	— 0·67
5·34	Berlin	2 2 9·848	— 1·38	— 0·39	17 10 30·14	+ 0·72	+ 0·60
5·34	Leipzig	2 2 9·86	— 2·29	— 1·30	17 10 30·3	+ 0·03	— 0·09
5·38	Greenwich	2 2 10·19	— 1·22	— 0·22	17 10 22·99	+ 0·86	+ 0·74
6·32	Cape	2 2 19·48	— 4·40	— 3·24	17 5 10·00	— 1·61	— 1·67
6·34	Leipzig	2 2 19·93	— 0·82	+ 0·34	17 4 53·5	+ 0·06	0·00
6·37	Greenwich	2 2 20·34	+ 0·29	+ 1·46	17 4 47·67	+ 1·23	+ 1·17
6·38	Oxford	2 2 20·39	— 0·01	+ 1·16	17 4 43·85	+ 2·18	+ 2·12
6·97	Melbourne	2 2 27·246	— 1·17	+ 0·09	17 1 41·01	— 1·03	— 1·05
7·32	Cape	2 2 31·98	+ 0·53	+ 1·85	16 59 49·03	— 0·11	— 0·11

(*e*) Very faint; observation of little value; cloudy.
(*a*), (*b*), (*c*), (*d*), (*e*). These five observations have been rejected in the subsequent discussion.

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1888. G. M. T.		Observed R.A.	Eph. Corr.	Curve Resid.	Observed Dec.	Eph. Corr.	Curve Resid.
		h m s	s	s	° ′ ″	″	″
December 7·33	Berlin	2 2 32·011	— 1·49	— 0·17	+ 16 59 32·08	+ 0·34	+ 0·34
7·34	Leipzig.....	2 2 32·10	— 1·41	— 0·09	16 59 30·4	— 0·88	— 0·88
7·36	Leiden	2 2 32·382	— 0·08	+ 1·24	16 59 23·88	— 1·30	— 1·30
7·37	Greenwich ...	2 2 32·46	— 2·21	— 0·88	16 59 26·12	+ 1·37	+ 1·37
8·28	Pulkowa	2 2 45·55	— 3·61	— 2·15	16 54 38·60	+ 1·56	+ 1·61
8·32	Cape	2 2 46·30	— 0·67	+ 0·79	16 54 40·87	+ 0·06	+ 0·11
8·33	Berlin	2 2 46·461	— 1·21	+ 0·26	16 54 24·15	+ 0·44	+ 0·49
8·33	Leipzig	2 2 46·59	— 0·63	+ 0·84	16 54 23·5	+ 0·21	+ 0·26
8·39	Dunsink	2 2 47·36	— 0·51	+ 0·96	16 54 8·1	+ 0·57	+ 0·62
9·38	Dunsink	2 3 3·94	— 3·33	— 1·73	16 49 14·0	— 0·59	— 0·49
10·31	Cape	2 3 21·74	— 0·37	+ 1·33	16 45 7·06	— 0·03	+ 0·11
10·33	Leipzig	2 3 21·96	— 2·49	— 0·79	16 44 50·4	+ 0·21	+ 0·35
11·31	Cape	2 3 42·71	— 0·78	+ 1·00	16 40 41·03	— 0·64	— 0·46
11·38	Dunsink	2 3 44·19	— 1·11	+ 0·67	16 40 10·1	— 1·51	— 1·33
12·27	Pulkowa	2 4 4·84	— 3·45	— 1·61	16 36 24·63	— 0·73	— 0·52
12·36	Oxford	2 4 7·19	— 1·64	+ 0·20	16 36 7·08	+ 1·66	+ 1·87
13·30	Cape	2 4 30·97	— 3·33	— 1·46	16 32 31·47	— 2·48	— 2·26
13·32	Berlin	2 4 31·434	— 1·61	+ 0·26	16 32 17·96	— 0·40	— 0·18
13·32	Leipzig.....	2 4 31·53	— 1·74	+ 0·13	16 32 17·8	— 0·32	— 0·10
14·30	Cape	2 4 58·65	+ 0·96	+ 2·84	16 28 51·13	— 0·45	— 0·22
14·32	Leipzig..	2 4 58·95	— 2·12	— 0·24	16 28 36·0	— 0·02	+ 0·21
15·27	Pulkowa	2 5 26·86	— 1·86	...	19 25 17·36	— 0·02	...
17·26	Pulkowa	2 6 31·96	— 1·03	...	16 19 4·55	+ 2·01	...
18·26	Pulkowa	2 7 7·49	— 1·05	...	16 16 15·94	— 0·18	...
19·31	Leipzig	2 7 46·82	— 3·33	...	16 13 36·6	— 0·80	...
21·30	Leipzig	2 9 7·95	— 1·38	...	16 9 12·8	+ 1·33	...

5.—Systematic Correction of the Ephemeris.

The preceding comparison with the meridian observations shows that the ephemeris does not accurately represent the path of the planet. It did not form part of my plan to deduce the most probable elements of Iris, so I have not undertaken a discussion of previous oppositions, but confined myself to deriving corrections from the meridian observations which would be sufficiently accurate for the elimination of the place of the planet in the discussion for parallax.

For this purpose the differential coefficients of the elements were formed for equidistant epochs, and the necessary correction to the ephemeris for these epochs derived from the values in the foregoing pages by expressing them in powers of the time. Putting, to render the equations homogeneous,

$$x = 3.dM_0 \qquad y = 1/7.d\Omega \qquad z = 2.d\pi$$
$$u = 10/7.di \qquad v = 1/2.d\phi \qquad w = 100.d\mu$$

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giving equal weight to each observation and applying the perturbations as deduced above, the following equations of condition were found :—

Date.		From R.A. Observations.							No. Obs.
Sept.	16·5	+ 0·875 x	− 0·193 y	+ 0·801 z	− 0·265 u	− 1·312 v	+ 0·549 w	= + 2″·086	1
	26·5	+ 0·967	− 0·225	+ 0·875	− 0·263	− 1·164	+ 0·702	− 1·422	19
Oct.	6·5	+ 1·045	− 0·253	+ 0·951	− 0·267	− 1·022	+ 0·827	− 1·764	12
	16·5	+ 1·110	− 0·303	+ 1·014	− 0·270	− 0·864	+ 0·919	− 0·390	17
	26·5	+ 1·147	− 0·327	+ 1·044	− 0·265	− 0·760	+ 0·964	+ 0·301	24
Nov.	5·5	+ 1·139	− 0·365	+ 1·036	− 0·251	− 0·652	+ 0·971	+ 1·402	16
	15·5	+ 1·090	− 0·386	+ 0·991	− 0·227	− 0·474	+ 0·941	+ 2·047	23
	25·5	+ 1·020	− 0·377	+ 0·926	− 0·197	− 0·244	+ 0·940	+ 0·367	21
Dec.	5·5	+ 0·937	− 0·373	+ 0·851	− 0·159	+ 0·024	+ 0·935	− 1·577	29
	15·5	+ 0·852	− 0·353	+ 0·775	− 0·120	+ 0·292	+ 0·953	− 2·101	14

Date.		From Dec. Observations.							No. Obs.
Sept.	16·5	+ 0·187 x	+ 0·552 y	+ 0·165 z	+ 1·041 u	+ 0·136 v	+ 0·367 w	= + 0″·338	1
	26·5	+ 0·208	+ 0·672	+ 0·183	+ 1·067	+ 0·212	+ 0·425	− 0·166	19
Oct.	6·5	+ 0·236	+ 0·794	+ 0·211	+ 1·070	+ 0·280	+ 0·474	+ 0·167	12
	16·5	+ 0·270	+ 0·904	+ 0·244	+ 1·046	+ 0·306	+ 0·506	+ 0·480	17
	26·5	+ 0·301	+ 1·000	+ 0·273	+ 0·993	+ 0·278	+ 0·510	+ 0·985	24
Nov.	5·5	+ 0·322	+ 1·065	+ 0·291	+ 0·908	+ 0·190	+ 0·484	+ 1·193	16
	15·5	+ 0·321	+ 1·096	+ 0·293	+ 0·792	+ 0·128	+ 0·430	+ 2·181	24
	25·5	+ 0·302	+ 1·098	+ 0·277	+ 0·668	+ 0·078	+ 0·366	+ 1·124	22
Dec.	5·5	+ 0·277	+ 1·079	+ 0·253	+ 0·545	+ 0·058	+ 0·303	+ 0·149	29
	15·5	+ 0·242	+ 1·046	+ 0·220	+ 0·424	+ 0·044	+ 0·250	− 0·006	14

Taking as unity of weight that for 24 observations, and giving each equation a weight proportional to the number of observations, the normal equations are found as follows :—

+ 8·493 x	− 0·465 y	+ 7·723 z	− 0·028 u	− 3·718 v	+ 7·768 w	= + 0″·506
− 0·465	+ 8·220	− 0·420	+ 6·370	+ 2·278	+ 0·733	+ 6·209
+ 7·723	− 0·420	+ 7·018	− 0·032	− 3·381	+ 7·058	+ 0·468
− 0·028	+ 6·370	− 0·032	+ 5·711	+ 2·135	+ 1·158	+ 4·740
− 3·718	+ 2·278	− 3·381	+ 2·135	+ 3·637	− 2·693	+ 0·988
+ 7·768	+ 0·733	+ 7·058	+ 1·158	− 2·693	+ 7·421	+ 1·087

The attempt to solve these normals showed that they suffice only to determine four of the unknown quantities at most, and that even by an arbitrary choice no entirely satisfactory representation of the meridian results could be attained. On plotting these deviations as given in the preceding section, they fall so nearly into a smooth curve that there seemed to be no doubt as to their reality, and I have thought it advisable to apply these corrections read off from the curves to the ephemeris before using it for the treatment of the heliometer results. Of course the values thus derived can only be considered as an empirical interpolating curve, and it will be necessary to provide for the complete elimination of the place of the planet and its variations.

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The following table gives the corrections I have thus applied, including the effect of the planetary perturbations, for the period of the heliometer series :—

Date.	Correction		Date.	Correction		Date.	Correction	
	In R.A.	In Dec.		In R.A.	In Dec.		In R.A.	In Dec.
	″	″		″	″		″	″
Oct. 10·0	− 1·00	+ 0·44	Nov. 1·0	+ 1·57	+ 1·61	Nov. 23·0	+ 1·26	+ 1·21
11	0·89	0·49	2	1·68	1·66	24	1·10	1·10
12	0·78	0·54	3	1·79	1·72	25	0·94	1·00
13	0·66	0·59	4	1·89	1·78	26	0·77	0·90
14	0·55	0·64	5	1·98	1·83	27	0·58	0·80
15	0·43	0·69	6	2·07	1·88	28	0·39	0·70
16	0·31	0·74	7	2·14	1·92	29	+ 0·20	0·60
17	0·20	0·79	8	2·21	1·96	30	0·00	0·50
18	− 0·08	0·85	9	2·27	1·99	Dec. 1	− 0·20	0·41
19	+ 0·03	0·90	10	2·31	2·02	2	0·39	0·33
20	0·15	0·96	11	2·34	2·04	3	0·57	0·26
21	0·27	1·01	12	2·34	2·03	4	0·75	0·20
22	0·38	1·07	13	2·33	2·00	5	0·93	0·14
23	0·50	1·12	14	2·30	1·96	6	1·11	0·08
24	0·62	1·18	15	2·25	1·92	7	1·27	+ 0·02
25	0·74	1·23	16	2·19	1·86	8	1·42	− 0·03
26	0·86	1·28	17	2·09	1·79	9	1·56	0·08
27	0·98	1·33	18	1·97	1·71	10	1·67	0·13
28	1·09	1·39	19	1·83	1·61	11	1·76	0·17
29	1·21	1·44	20	1·70	1·51	12	1·83	0·20
30	1·33	1·50	21	1·57	1·41	13	1·86	0·22
31·0	+ 1·45	+ 1·55	22·0	+ 1·42	+ 1·31	14·0	− 1·88	− 0·23

A point on which I felt it desirable to be assured was whether the distance of the planet given by the adopted ephemeris was accurate within the requisite limits. The ephemeris computed by the Berlin *Jahrbuch* office was based on Brünnow's tables, and as these do not require any very large correction at present the mean motion, and consequently the distances, are likely to be not greatly in error. The comparison of the two ephemerides for the epoch of the heliometer series is as follows :—

Date, 1888. Mean Time, Greenwich.	Log. Distance		Difference of Log. Distances.	Corresponding Error on 8″·80.
	from Berlin *Jahrbuch*.	from Ephemeris.		
				″
October 10·5	9·95238	9·95220	0·00018	0·0035
30·5	9·92833	9·92817	0·00016	0·0033
November 19·5	9·94795	9·94785	0·00010	0·0020
December 9·5	0·00233	0·00227	0·00006	0·0012

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As the mean epoch of the heliometer series is about the first half of November, it would appear that the solar parallax resulting from the distances employed should be diminished by 0″·003.

6.—Derivation of Computed Distances and Position-Angles.

With the data of the preceding sections, the computed values of the distances and position-angles of the planet and star have been formed, with which the observed values are to be compared. The mean places of the stars were taken from the following table :—

ADOPTED MEAN PLACES OF COMPARISON STARS FOR 1888·0.

Star.	R.A.	Declination.	Magnitude.
°	° ′ ″	° ′ ″	
+ 22·375	37 51 19·68	+ 22 38 33·76	8·3
24·376	37 38 14·38	24 9 33·32	7·0
22·372	37 34 40·11	22 33 49·31	7·6
22·368	37 4 9·40	22 28 34·59	8·1
24·369	37 2 57·40	24 24 4·10	8·2
21·349	36 30 25·36	21 50 17·13	8·1
24·358	36 1 27·04	24 44 17·65	6·2
20·404	35 44 25·02	21 5 38·00	7·5
22·354	35 42 38·14	22 58 6·39	6·0
23·326	35 28 20·37	24 7 44·35	8·6
22·347	35 9 28·57	22 22 27·25	7·8
24·347	34 51 50·83	24 39 11·43	7·5
20·388	34 22 29·85	20 54 16·80	8·5
22·331	33 43 28·57	22 54 47·80	7·8
19·346	33 34 29·47	19 36 35·42	8·5
22·329	33 9 37·24	22 39 2·69	6·0
21·321	33 4 12·97	21 22 49·37	8·0
19·340	32 58 25·78	19 22 57·46	6·0
21·317	32 51 31·86	22 8 34·03	8·3
21·304	32 9 54·07	22 6 25·60	7·8
18·283	31 54 43·23	19 5 22·41	7·2
20·348	31 37 57·82	20 41 3·90	5·6
21·298	31 30 43·33	21 27 26·45	8·4
20·341	31 16 30·69	20 50 57·30	7·5
18·277	31 6 16·27	18 58 17·91	6·0
19·329	30 52 28·36	19 49 1·95	7·5
16·247	30 48 28·56	16 41 55·05	6·8
17·315	30 24 15·34	17 29 44·23	7·3
19·324	30 0 58·81	20 3 25·77	7·7
17·307	29 23 30·00	17 42 52·62	7·0

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The corrections to apparent place were computed including the small terms depending on 2☾, &c., as were the reductions for the planet, and taken as in the following table :—

CORRECTIONS FOR APPARENT PLACE OF COMPARISON STARS.

	+ 24°·376			
			′	″
Oct.	10·5	R.A. +	44·17	D. + 9·57
	11·5		44·50	9·73
	12·5		44·80	9·88
	13·5		45·09	10·03
	16·5		45·62	10·43
	17·5		45·72	10·52
	18·5		45·80	10·58
	19·5		45·92	10·65
	20·5		46·07	10·72
	21·5		46·27	10·79
	+ 22°·354			
Oct.	16·5	R.A. +	45·27	D. + 11·09
	17·5		45·36	11·18
	18·5		45·43	11·24
	19·5		45·54	11·30
	20·5		45·67	11·36
	21·5		45·85	11·43
	22·5		46·06	11·52
	23·5		46·28	11·62
	24·5		46·52	11·74
	25·5		46·76	11·88
	+ 24°·369			
Oct.	14·5	R.A. +	44·84	D. + 10·56
	15·5		45·02	10·66
	+ 22°·375			
Oct.	14·5	R.A. +	44·82	D. + 10·31
	15·5		44·99	10·39
	+ 24°·358			
Oct.	15·5	R.A. +	45·74	D. + 10·70
	16·5		45·85	10·81
	17·5		45·94	10·91
	18·5		46·03	10·99
	19·5		46·13	11·06
	+ 22°·372			
			′	″
Oct.	15·5	R.A. +	44·97	D. + 10·51
	16·5		45·09	10·62
	17·5		45·19	10·70
	18·5		45·28	10·77
	19·5		45·38	10·81
	+ 23°·326			
Oct.	20·5	R.A. +	46·05	D. + 11·33
	21·5		46·25	11·42
	+ 22°·368			
Oct.	20·5	R.A. +	45·57	+ D. 11·01
	21·5		45·76	11·08
	+ 22°·347			
Oct.	25·5	R.A. +	46·55	D. + 12·05
	26·5		46·74	12·18
	27·5		46·89	12·30
	+ 22°·331			
Oct.	28·5	R.A. +	47·10	+ D. 12·80
	29·5		47·17	12·90
	30·5		47·22	12·97
	+ 22°·329			
Oct.	31·5	R.A. +	47·09	D. + 13·20
Nov.	1·5		47·13	13·25
	2·5		47·19	13·30
	7·5		48·01	13·60
	+ 20°·404			
Oct.	28·5	R.A. +	46·65	D. + 12·29
	29·5		46·72	12·37
	30·5		46·78	12·43
	31·5		46·81	12·48
	+ 20°·388			
Nov.	1·5	R.A. +	46·68	D. + 12·91
	2·5		46·75	12·95
	3·5		46·85	12·97
	+ 22°·347			
			′	″
Oct.	29·5	R.A. +	47·12	D. + 12·50
	30·5		47·15	12·57
	31·5		47·16	12·63
Nov.	1·5		47·23	12·69
	2·5		47·30	12·73
	3·5		47·41	12·79
	+ 21°·321			
Nov.	4·5	R.A. +	46·99	D. + 13·41
	5·5		47·14	13·49
	6·6		47·33	13·58
	+ 21°·317			
Nov.	3·5	R.A. +	47·16	D. + 13·43
	+ 19°·340			
Nov.	7·5	R.A. +	46·87	D. + 13·60
	8·5		47·02	13·69
	9·5		47·13	13·77
	10·5		47·19	13·86
	11·5		47·22	13·93
	12·5		47·23	13·96
	13·5		47·15	13·99
	+ 21°·304			
Nov.	7·5	R.A. +	47·59	D. + 13·98
	8·5		47·74	14·02
	9·5		47·84	14·17
	+ 20°·341			
Nov.	10·5	R.A. +	47·35	D. + 14·42
	11·5		47·37	14·50
	12·5		47·35	14·55
	13·5		47·28	14·58
	14·5		47·22	14·59
	15·5		47·15	14·61

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	+ 19°·329		
		′	′
Nov.	16·5	R.A. + 46·72	D. + 14·60
	17·5	46·73	14·60
	+ 18°·283		
Nov.	14·5	R.A. + 46·83	D. + 14·24
	15·5	46·76	14·24
	16·5	46·73	14·24
	17·5	46·74	14·24
	+ 19°·324		
Nov.	13·5	R.A. + 46·79	D. + 14·82
	14·5	46·73	14·83
	15·5	46·66	14·84
	16·5	46·61	14·85
	17·5	46·61	14·85
	23·5	46·89	15·18
	24·5	46·86	15·23
	25·5	46·78	15·26
	+ 18°·277		
		′	′
Nov.	18·5	R.A. + 46·55	D. + 14·46
	19·5	46·61	14·50
	20·5	46·69	14·54
	21·5	46·77	14·61
	22·5	46·82	14·67
	+ 16°·247		
Nov.	23·5	R.A. + 46·15	D. + 14·42
	24·5	46·12	14·46
	25·5	46·06	14·47
	28·5	45·75	14·44
	29·5	45·64	14·42
	30·5	45·59	14·40
Dec.	1·5	45·58	14·39
	2·5	45·58	14·39
	3·5	45·63	14·41
	4·5	45·67	14·44
	5·5	45·69	14·46
	6·5	45·71	14·52
	+ 16°·247—*cont.*		
		′	′
Dec.	7·5	R.A. + 45·65	D. + 14·54
	8·5	45·57	14·53
	9·5	45·42	14·54
	10·5	45·25	14·49
	11·5	45·05	14·46
	12·5	44·89	14·40
	13·5	44·71	14·35
	+ 17°·315		
Nov.	28·5	R.A. + 45·85	D. + 14·71
	29·5	45·75	14·67
	30·5	45·69	14·67
Dec.	1·5	45·66	14·66
	2·5	45·66	14·67
	3·5	45·72	14·67
	4·5	45·76	14·72
	5·5	45·77	14·77
	6·5	45·78	14·81
	7·5	45·73	14·83

For the planet the co-ordinates have been interpolated for epochs of 0·01 of a day covering the times of the heliometer observations, and the systematic correction of Section 5 applied. The parallax of the planet was computed by means of the sidereal local times corresponding to these epochs, using the value 8″·80 for the mean equatorial parallax of the sun, and the co-ordinates of the observatories from the Berlin *Jahrbuch*.

With the apparent places of planet and stars thus derived, the distances and position-angles have been computed, the latter being the half sum of the angles at the two objects. These values are found in the tables of the following pages. The computations were carried to three decimals of seconds of arc, but I have rounded off the results to half hundreds of this unit, by placing a dot after the number whenever the last figure was 3, 4, 5, 6 or 7. For interpolating the distances for the observation times, these dots have been taken as a 5.

The two stars + 19°·340 and + 20°·348 were the standards chosen for the scale-value and index-error determination when but one star was compared with the planet. From the above places their relative polar co-ordinates are found to be for 1888·0 :—

Distance : 6521″·900, Position-Angle : 135° 56′ 1″·3 ;

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and applying the corrections for aberration, precession and nutation, their apparent values become :—

1888.	Distance.	Position-Angle.
	″	° ′ ″
October 10·5	6521·704	135 56 16·5
20	21·814	16·9
30	21·922	17·2
November 9	22·029	17·4
19	22·134	17·5
29	22·234	17·3
December 9	22·327	16·9
19·5	22·410	16·3

A series of values which I have used, as explained later on, are the position-angles (p_0) of the pairs of stars to which the planet was referred. They have been taken as follows, only an approximation being necessary.

Group.	Stars.		p_0.
	°	°	° ′
C	+ 22·372	+ 24·358	146 48
D	22·368	23·326	138 25
H	22·331	20·404	134 14
I	22·329	20·404	123 2
J	22·329	20·388	147 8
K	21·317	20·388	131 17
M	21·304	19·340	164 29
N	20·341	19·340	132 26
R	19·324	16·247	167 24
T	17·315	16·247	154 10
W	24·376	22·354	56 0
X	22·347	21·321	62 50
Z	19·340	19·324	103 37

COMPUTED DISTANCES AND POSITION-ANGLES.—CAPE.

Date, Greenwich Mean Time.	Cape Sidereal Time.	Parallax		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888.	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Oct. 12·57	4 22 55	−4·23·	+7·99	+24·376	755·86·	162 23 56	...	...	...
·58	4 37 21	4·72·	7·88·	,,	756·67	162 49 20	...	...	...
·59	4 51 48	−5·20	+7·77	,,	757·54	163 14 41	...	...	...

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Date, Greenwich Mean Time.	Cape Sidereal Time.	Parallax.		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	′	′	°	″	° ′ ″	°	″	° ′
Oct. 13·58	4 41 18	−4·90	+7·88	+24·376	998·16·	194 40 5	...	...	...
·59	4 55 44	5·36·	7·76	„	1002·06·	194 55 22	...	...	...
·60	5 10 11	−5·81·	+7·63	„	1005·98	195 10 28	...	...	...
Oct. 14·53	3 33 3	−2·48	+8·31	+24·369	2409·11	149 50	+22·375	...	...
·54	3 47 29	3·02	8·24·	„	2408·69	149 59	„	4486·99·	341 6
·55	4 1 55	3·55·	8·17	„	2408·31	150 8	„	4486·20·	341 1
·56	4 16 22	4·08	8·08	„	2407·96	150 17	„	4485·40·	340 57
·57	4 30 48	4·58	7·98	„	2407·64	150 25	„	4484·60	340 52
·58	4 45 15	5·06·	7·86·	„	2407·36	150 34	„	4483·78·	340 47
·59	4 59 41	5·52·	7·74·	„	2407·11·	150 43	„	4482·96·	340 42
·60	5 14 7	−5·97	+7·61	„	2406·91	150 52	„	...	...
Oct. 15·53	3 36 59	−2·72	+8·31·	+22·372	4383·69·	346 8	+24·358	...	...
·54	3 51 26	3·26	8·24·	„	4382·26	346 3	„	...	...
·55	4 5 52	3·78·	8·16·	„	4380·81·	345 59	„	...	...
·56	4 20 18	4·30	8·07	„	4379·36·	345 54	„	...	...
·57	4 34 45	4·80	7·96·	„	4377·90·	345 49	„	5396·85	131 37
·58	4 49 11	5·27·	7·84·	„	4376·44·	345 44	„	5394·53·	131 40
·59	5 3 37	5·73·	7·71·	„	4374·97·	345 39	„	5392·21	131 44
·60	5 18 4	−6·17	+7·58	„	4373·50	345 34	„	...	...
Oct. 21·50	3 17 19	−2·10	+8·49	+23·326	4163·01	144 1	+22·368	3835·45·	312 18
·51	3 31 46	2·66	8·43·	„	4162·19·	144 7	„	3837·88·	312 11
·52	3 46 12	3·21	8·36·	„	4161·41	144 14	„	3840·30·	312 5
·53	4 0 39	3·75·	8·28·	„	4160·65·	144 20	„	3842·72·	311 58
·54	4 15 5	4·28	8·19·	„	4159·93	144 26	„	3845·14	311 51
·55	4 29 31	4·79	8·09	„	4159·24	144 33	„	3847·55	311 45
·56	4 43 58	5·28	7·98	„	4158·58·	144 39	„	3849·96	311 38
·57	4 58 24	5·74·	7·85·	„	4157·96·	144 45	„	3852·38	311 31
·58	5 12 50	6·19	7·72	„	4157·38	144 52	„	3854·80	311 25
·59	5 27 17	−6·61·	+7·57	„	4156·83·	144 58	„	...	...
Oct. 22·51	3 35 42	−2·84·	+8·42·	+22·354	...	67 58 27	...	...	...
·52	3 50 9	3·39	8·35	„	...	68 2 3	...	...	...
·53	4 4 35	3·93	8·27	„	...	68 5 46	...	...	...
·54	4 19 1	4·45	8·17·	„	...	68 9 35	...	...	...
·55	4 33 28	4·95·	8·06	„	...	68 13 31	...	...	...
·56	4 47·54	5·44	7·95	„	...	68 17 34	...	...	...
·57	5 2 20	−5·90	+7·82	„	...	68 21 44	...	...	...

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1888	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Oct. 24·51	3 43 36	−3·22	+8·39	+22·354	477·41	212 44 19	...	...	...
·52	3 58 2	3·76	8·31	,,	484·86	213 9 47	...	..	...
·53	4 12 28	4·29	8·22	,,	492·34	213 34 20	...	...	...
·54	4 26 55	4·80	8·12	,,	499·85	213 57 59	...	...	...
·55	4 41 21	5·29	8·01	,,	507·38	214 20 49	...	...	...
·56	4 55 47	5·76	7·88	,,	514·93	214 42 50	...	...	...
·57	5 10 14	6·21	7·75	,,	...	215 4 5	...	...	...
·58	5 24·40	−6·63	+7·60	,,	...	215 24 36	...	...	...
Oct. 25·49	3 18 39	−2·28	+8·50	+22·354	1220·99	227 37 19	+22·347	...	...
·50	3 33 6	2·85	8·44	,,	1229·24	227 41 38	,,	1605·77	35 14 10
·51	3 47 32	3·40	8·37	,,	1237·50	227 45 50	,,	1598·04	35 7 9
·52	4 1 58	3·94	8·29	,,	1245·76	227 49 56	,,	1590·31	35 0 6
·53	4 16 25	4·46	8·20	,,	1254·02	227 53 55	,,	1582·58	34 53 1
·54	4 30 51	4·97	8·09	,,	1262·29	227 57 47	,,	1574·85	34 45 55
·55	4 45 17	−5·46	+7·97	,,	1270·58	228 1 34	,,	...	...
Oct. 26·51	3 51 29	−3·58	+8·35	+22·347	900·22	16 23 13	...	...	...
·52	4 5 55	4·11	8·26	,,	893·81	16 1 44	...	...	...
·53	4 20 21	4·63	8·16	,,	887·44	15 39 59	...	...	...
·54	4 34 48	5·13	8·05	,,	881·09	15 18 0	...	...	...
·55	4 49 14	5·61	7·94	,,	874·77	14 55 47	...	...	...
·56	5 3 40	−6·07	+7·80	,,	868·48	14 33 21	...	...	...
Oct. 27·50	3 40 59	−3·21	+8·40	+22·347	580·99	315 12 3	...	...	...
·51	3 55 25	3·75	8·32	,,	582·79	314 22 24	...	...	...
·52	4 9 52	4·28	8·23	,,	584·69	313 33 4	...	...	...
·53	4 24 18	4·79	8·13	,,	586·68	312 44 4	...	...	...
·54	4 38 44	5·28	8·02	,,	588·78	311 55 25	...	...	...
·55	4 53 11	5·76	7·89	,,	590·98	311 7 9	...	...	...
·56	5 7 37	−6·21	+7·76	,,	593·26	310 19 16	...	...	...
Oct. 29·48	3 20 0	−2·46	+8·47	+22·331	3900·78	129 12	+20·404	...	...
·49	3 34 26	3·02	8·41	,,	3898·27	129 20	,,	5513·30	317 44
·50	3 48 52	3·57	8·34	,,	3895·80	129 27	,,	5514·59	317 38
·51	4 3 18	4·10	8·25	,,	...	...	,,	5515·88	317 33
·52	4 17 44	−4·62	+8·16	,,	...	...	,,	5517·16	317 27
Oct. 30·48	3 23 56	−2·65	+8·45	+22·331	3775·37	141 31	+20·404	5667·89	309 22
·49	3 38 22	3·20	8·38	,,	3774·80	141 39	,,	5670·38	309 17
·50	3 52 49	3·75	8·31	,,	3774·26	141 47	,,	5672·86	309 12
·51	4 7 15	4·28	8·21	,,	3773·77	141 55	,,	5675·34	309 7
·52	4 21 41	4·79	8·11	,,	3773·32	142 3	,,	5677·80	309 1
·53	4 36 8	5·28	8·00	,,	3772·93	142 11	,,	5680·27	308 56
·54	4 50 34	−5·75	+7·88	,,	3772·61	142 19	,,	...	...

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		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″		″	° ′
Oct. 31·48	3 27 52	−2·83	+8·41	+22·329	4354·46	125 11	+20·404	...	...
·49	3 42 19	3·38	8·35	"	4351·64	125 18	"	5936·42	301 22
·50	3 56 45	3·92	8·27	"	4348·82	125 24	"	5939·98	301 18
·51	4 11 12	4·44	8·17	"	4346·00	125 31	"	5943·53	301 13
·52	4 25 38	4·95	8·07	"	4343·18	125 37	"	5947·07	301 9
·53	4 40 4	5·43	7·96	"	4340·36	125 44	"	5950·60	301 4
·54	4 54 31	5·90	7·83	"	...	...	"	5954·11	300 59
·55	5 8 57	6·34	7·70	"	...	...	"	5957·62	300 54
·56	5 23 23	−6·76	+7·56	"	...	...	"	...	...
Nov. 2·48	3 35 45	−3·17	+8·34	+22·329	4177·27	147 47	+20·388	...	...
·49	3 50 11	3·72	8·27	"	4177·96	147 54	"	3306·36	326 10
·50	4 4 38	4·24	8·18	"	4178·68	148 2	"	3305·96	326 1
·51	4 19 4	4·76	8·08	"	4179·45	148 9	"	3305·56	325 51
·52	4 33 31	5·25	7·97	"	4180·25	148 16	"	3305·17	325 42
·53	4 47 57	−5·72	+7·85	"	4181·08	148 24	"	3304·79	325 33
Nov. 3·49	3 54 8	−3·89	+8·22	+21·317	3407·61	131 0	+20·388	...	...
·50	4 8 34	4·41	8·14	"	3405·82	131 8	"	...	...
·51	4 23 1	4·91	8·03	"	3404·09	131 17	"	3352·01	311 17
·52	4 37 27	5·40	7·92	"	3402·40	131 26	"	3353·76	311 8
·53	4 51 54	5·86	7·80	"	3400·72	131 35	"	3355·52	311 0
·54	5 6 20	−6·30	+7·67	"	3399·06	131 43	"	...	...
Nov. 4·48	3 43 38	−3·52	+8·26	+21·321	...	90 44 15	...	...	...
·49	3 58 4	4·05	8·17	"	...	90 59 43	...	...	...
·50	4 12 31	4·57	8·08	"	...	91 15 27	...	...	...
·51	4 26 57	5·07	7·97	"	...	91 31 26	...	...	...
·52	4 41 24	5·54	7·86	"	...	91 47 37	...	...	...
·53	4 55 50	−5·99	+7·74	"	...	92 3 58	...	...	...
Nov. 5·47	3 33 9	−3·15	+8·28	+21·321	802·93	132 54	...	...	...
·48	3 47 35	3·69	8·21	"	801·64	133 31	...	...	..
·49	4 2 2	4·22	8·12	"	800·48	134 8	...	...	...
·50	4 16 28	4·72	8·03	"	799·42	134 46	...	...	...
·51	4 30 54	5·21	7·92	"	798·49	135 24	...	...	...
·52	4 45 21	5·68	7·80	"	797·66	136 1	...	...	...
·53	4 59 47	−6·13	+7·68	"	796·96	136 38	...	...	...
Nov. 6·45	3 8 13	−2·21	+8·34	+21·321	1076·76	181 38	...	...	...
·46	3 22 39	2·77	8·29	"	1082·46	181 59	...	...	...
·47	3 37 5	3·32	8·23	"	1088·20	182 20	...	...	...
·48	3 51 32	3·85	8·15	"	1094·00	182 41	...	...	...
·49	4 5 58	−4·37	+8·06	"	1099·84	183 1	...	...	...

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		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′	°	″	° ′
Nov. 7·46	3 26 35	−2·94·	+8·24	+21·304	4862·64	150 45	+19·340	5575·66·	356 33
·47	3 41 1	3·48·	8·18	,,	4864·24	150 51	,,	5570·56·	356 29
·48	3 55 28	4·02	8·10	,,	4865·87	150 57	,,	5565·45·	356 24
·49	4 9 54	4·52·	8·01	,,	4867·54	151 3	,,	5560·33	356 20
·50	4 24 21	5·02	7·91	,,	4869·25	151 9	,,	5555·20	356 15
·51	4 38 47	5·49·	7·79·	,,	4870·99	151 15	,,	5550·07	356 11
·52	4 53 14	5·94·	7·67·	,,	4872·76	151 21	,,	5544·94	356 7
·53	5 7 40	6·37·	7·54·	,,	4874·56·	151 27	,,	5539·81	356 3
·54	5 22 6	−6·78	+7·41	,,	4876·39·	151 33	,,	...	...
Nov. 9·44	3 5 37	−2·18·	+8·25·	+21·304	5461·75	167 21	+19·340	...	...
·45	3 20 3	2·73·	8·20·	,,	5465·79·	167 25	,,	4729·58	341 5
·46	3 34 30	3·28	8·14	,,	5469·86	167 29	,,	4726·39	340 59
·47	3 48 56	3·80·	8·07	,,	5473·95	167 34	,,	4723·19	340 53
·48	4 3 22	4·32·	7·98·	,,	5478·05·	167 39	,,	4719·99·	340 48
·49	4 17 48	−4·82	+7·88·	,,	5482·17·	167 43	,,	...	...
Nov. 10·46	3 38 25	−3·44	+8·08·	+20·341	3862·58·	110 39	+19·340	...	...
·47	3 52 51	3·96	8·01	,,	3858·83·	110 45	,,	4451·36·	331 30
·48	4 7 18	4·47	7·92	,,	3855·12·	110 52	,,	4449·39·	331 24
·49	4 21 44	4·96	7·82·	,,	3851·45	110 59	,,	4447·41·	331 18
·50	4 36 11	5·42·	7·71·	,,	3847·81	111 6	,,	4445·43·	331 12
·51	4 50 37	5·87·	7·60	,,	3844·21	111 13	,,	4443·44·	331 6
·52	5 5 4	6·30	7·47·	,,	3840·64·	111 19	,,	4441·46	331 0
53	5 19 30	−6·70	+7·34	,,	3836·12	111 26	,,	...	...
Nov. 11·46	3 42 22	−3·59	+8·02·	+20·341	3609·46·	122 1	+19·340	...	...
·47	3 56 48	4·11	7·94·	,,	3607·41	122 8	,,	4300·52·	321 24
·48	4 11 15	4·61	7·85·	,,	3605·39·	122 16	,,	4299·88	321 18
·49	4 25 41	5·09	7·75·	,,	3603·41·	122 23	,,	4299·27·	321 12
·50	4 40 7	−5·55	+7·64·	,,	3601·47	122 30	,,	...	...
Nov. 12·45	3 31 52	−3·22	+8·03·	+20·341	3528·70	134 9	+19·340	...	...
·46	3 46 18	3·74	7·96·	,,	3528·49	134 16	,,	4275·34	311 14
·47	4 0 45	4·25·	7·88·	,,	3528·31	134 24	,,	4276·01·	311 7
·48	4 15 11	4·74·	7·79	,,	3528·16	134 32	,,	4276·68·	311 0
·49	4 29 38	5·22	7·69	,,	3528·04	134 40	,,	4277·35	310 54
·50	4 44 4	5·67·	7·58	,,	3527·96	134 48	,,	4278·00·	310 47
·51	4 58 31	6·10·	7·45·	,,	3527·92·	134 55	,,	4278·66	310 41
·52	5 12 57	−6·51	+7·32	,,	...	...	,,	4279·31	310 35

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		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°		°
Nov. 13·44	3 21 23	−2·84·	+8·04	+20·341	3619·29	146 1	+19·340	...	...
·45	3 35 49	3·37	7·97·	„	3620·80	146 8	„	4368·12	301 22
·46	3 50 16	3·89	7·90	„	3622·34	146 15	„	4369·99·	301 16
·47	4 4 42	4·39	7·81·	„	3623·91	146 22	„	4371·85·	301 10
·48	4 19 8	4·87·	7·72	„	3625·52	146 29	„	4373·72·	301 4
·49	4 33 35	5·34	7·62	„	3627·16	146 37	„	4375·58	300 58
·50	4 48 1	5·78·	7·50·	„	3628·83	146 44	„	4377·42	300 52
·51	5 2 27	−6·20·	+7·38·	„	3630·53	146 51	„	...	...
Nov. 18·38	2 14 26	−0·36·	+7·95·	+18·277	1169·70	19 59	...	...	...
·39	2 28 52	0·91·	7·94·	„	1163·24	19 52	...	...	...
·40	2 43 19	1·46·	7·92	„	1156·79	19 45	...	...	...
·41	2 57 45	2·00·	7·88·	„	1150·32	19 39	...	...	...
·42	3 12 12	2·53·	7·84	„	1143·83	19 32	...	...	...
·45	3 55 31	4·07	7·64·	„	...	19 10 24	...	...	...
·46	4 9 58	4·55	7·56	„	...	19 3 16	...	...	...
·47	4 24 24	5·01·	7·46·	„	...	18 56 7	...	...	...
·48	4 38 50	5·45·	7·36·	„	...	18 48 58	...	...	...
·49	4 53 17	5·87·	7·25	„	...	18 41 49	...	...	...
·50	5 7 43	6·28	7·13	„	...	18 34 38	...	...	...
·51	5 22 9	−5·65	+7·00·	„	...	18 27 26	...	...	...
Nov. 19·45	3 50 28	−4·19·	+7·57·	+18·277	539·48·	359 36	...	...	...
·46	4 13 54	4·67	7·49	„	534·25	359 10	...	...	...
·47	4 28 21	5·12·	7·39·	„	529·04	358 43 14	...	...	...
·48	4 42 47	5·55·	7·28·	„	523·85	358 16 19	...	...	...
·49	4 57 13	5·97	7·17	„	...	357 48 49	...	...	...
·50	5 11 40	6·35	7·05·	„	...	357 21 1	...	...	...
·51	5 26 6	6·72	6·92	„	...	356 52 51	...	...	...
·52	5 40 32	−7·05·	+6·78·	„	...	356 24 18	...	...	...
Nov. 20·38	2 22 20	−0·68·	+7·84·	+18·277	...	100 30 31	...	...	...
·39	2 36 46	1·23	7·82·	„	...	99 30 47	...	...	...
·40	2 51 13	1·77	7·79·	„	...	98 32 1	...	...	...
·41	3 5 39	2·30	7·75·	„	...	97 34 15	...	...	...
·42	3 20 5	2·82	7·70·	„	...	96 37 26	...	...	...
·43	3 34 32	3·33·	7·65	„	...	95 41 36	...	...	...
·44	3 48 58	3·83	7·58	„	...	94 46 45	...	...	...
·45	4 3 24	4·31·	7·50	„	350·72	93 53	...	...	...
·46	4 17 51	4·78	7·41	„	354·17	93 0	...	...	...
·47	4 32 17	5·22·	7·31	„	357·67	92 8	...	...	..
·48	4 46 44	5·65·	7·20·	„	361·23·	91 17	...	...	...
·49	5 1 10	−6·05·	+7·09·	„	364·84·	90 27	...	...	..

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1888	h m s	″	″	°	″	° ′ ″		″	° ′
Nov. 21·41	3 9 35	−2·44·	+7·69·	+18·277	...	234 39 12	...	...	...
·42	3 24 2	2·95·	7·64	,,	...	234 30 13	...	...	...
·43	3 38 29	−3·46	+7·58	,,	...	234 21 18	...	...	...
Nov. 22·27	23 51 23	+4·68	+7·33·	+18·277	1269·15	225 9	...	...	...
·28	0 5 49	4·21·	7·42	,,	1274·90	225 5	...	...	...
·29	0 20 16	3·73·	7·49·	,,	1280·66·	225 2	...	...	...
·30	0 34 42	+3·24	+7·56	,,	1286·44·	224 59	...	...	...
Nov. 22·42	3 27 59	−3·09·	+7·57·	+18·277	...	224 23 13	...	...	...
·43	3 42 25	3·59	7·51	,,	...	224 20 11	...	...	...
·44	3 56 51	4·07·	7·44	,,	...	224 17 7	...	...	...
·45	4 11 17	−4·54	+7·35·	,,	...	224 14 4	...	...	...
Nov. 23·43	3 46 22	−3·71	+7·43·	+19·324	5921·56	155 10	+16·247	...	...
·44	4 0 48	4·18·	7·36	,,	5924·86	155 13	,,	6715·50·	358 14
·45	4 15 14	4·65	7·27·	,,	5928·12	155 16	,,	6710·66	358 12
·46	4 29 40	−5·08·	+7·18·	,,	5931·43	155 18	,,	6705·78·	358 11
Nov. 24·41	3 21 25	−2·85	+7·49	+19·324	6268·66·	158 51	+16·247	...	...
·42	3 35 51	3·34·	7·43·	,,	6272·22·	158 54	,,	6255·10·	356 0
·43	3 50 18	3·82·	7·36·	,,	6275·80·	158 56	,,	6250·46	355 59
·44	4 4 44	4·29·	7·29	,,	6279·40	158 58	,,	6245·80·	355 57
·45	4 19 10	−4·75	+7·20·	,,	6283·02	159 0	,,	...	...
Nov. 28·41	3 37 11	−3·37·	+7·20	+17·315	...	11 37 31	...	...	...
·42	3 51 37	3·84·	7·13	,,	...	11 36 27	...	...	...
·43	4 6 4	4·29·	7·05·	,,	...	11 35 26	...	...	...
·44	4 20 30	4·73	6·97	,,	...	11 34 27	...	...	...
·45	4 34 56	5·14	6·88	,,	...	11 33 32	...	...	...
·46	4 49 23	5·54	6·78	,,	...	11 32 39	...	...	...
·47	5 3 49	−5·91·	+6·67	,,	...	11 31 48	...	...	...
Nov. 29·37	2 43 22	−1·52·	+7·30·	+17·315	1163·52·	12 3	...	...	...
·38	2 57 48	2·03	7·27·	,,	1159·14	12 2	...	...	...
·39	3 12 15	2·52·	7·23	,,	1154·74	12 2	...	...	...
·40	3 26 41	3·01	7·18	,,	1150·33·	12 1 28	...	...	...
·41	3 41 8	3·48·	7·12	,,	1145·91	12 0 56	...	...	...
·42	3 55 35	3·94·	7·05	,,	...	12 0 27	...	...	...
·43	4 10 1	4·39	6·97·	,,	...	12 0 1	...	...	...
·44	4 24 28	−4·81·	+6·89	,,	...	11 59 37	...	...	...
Nov. 30·32	1 35 7	+0·94·	+7·37·	+17·315	767·72	14 55	...	...	...
·33	1 49 33	+0·43·	7·38·	,,	763·54·	14 56	...	...	...
·34	2 4 0	−0·08	7·39	,,	759·36	14 57	...	...	...
·35	2 18 26	−0·59	7·38·	,,	755·17·	14 58	...	...	...
·36	2 32 52	−1·10	+7·37	,,	750·98	14 59	...	...	...

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Date. Greenwich Mean Time.	Cape Sidereal Time.	Parallax. In R.A.	Parallax. In Dec.	Comparison Star.	Computed Distance.	Computed Position-Angle.	Comparison Star.	Computed Distance.	Computed Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Dec. 2·36	2 40 45	−1·36	+7·14	+17·315	...	110 10 18	...	...	...
·37	2 55 12	1·85	7·11	,,	...	111 12 25	...	...	...
·38	3 9 39	2·34	7·08	,,	...	112 13 50	...	...	...
·39	3 24 5	2·82	7·03	,,	207·05	113 14 33	...	...	...
·40	3 38 31	3·29	6·97	,,	208·50	114 14	...	...	...
·41	3 52 58	3·74	6·90	,,	210·04	115 13	...	...	...
·42	4 7 24	4·17	6·83	,,	211·65	116 12	...	...	...
·43	4 21 51	4·60	6·75	,,	213·34	117 9	...	...	...
·44	4 36 17	5·00	6·66	,,	215·11	118 5	...	...	...
·45	4 50 43	−5·38	+6·57	,,	216·96	119 0	...	...	...
Dec. 3·37	2 59 9	−1·97	+7·05	+17·315	510·45	152 16	...	...	...
·38	3 13 35	2·45	7·01	,,	513·85	152 27	...	...	...
·39	3 28 2	2·92	6·96	,,	517·28	152 37	...	...	...
·40	3 42 28	3·38	6·91	,,	520·72	152 47	...	...	...
·41	3 56 55	3·83	6·83	,,	524·18	152 58	...	...	...
·42	4 11 21	4·26	6·76	,,	527·65	153 8	...	...	...
·43	4 25 48	4·67	6·68	,,	531·14	153 18	...	...	...
·44	4 40 14	−5·07	+6·61	,,	534·66	153 27	...	...	...
Dec. 4·37	3 3 5	−2·08	+6·98	+17·315	875·57	158 47	+16·247	...	...
·38	3 17 31	2·55	6·93	,,	879·13	158 50	,,	2312·87	332 24
·39	3 31 58	3·02	6·88	,,	882·70	158 53	,,	2309·42	332 22
·40	3 46 24	3·48	6·82	,,	...	...	,,	2305·96	332 20
·41	4 0 50	3·91	6·75	,,	...	...	,,	2302·48	332 17
·42	4 15 17	4·34	6·68	,,	...	...	,,	...	...
·43	4 29 43	4·75	6·60	,,	897·09	159 6	,,	...	...
·44	4 44 10	5·14	6·51	,,	900·72	159 9	,,	...	...
·45	4 58 36	5·50	6·41	,,	904·37	159 11	,,	...	...
·46	5 13 2	−5·84	+6·31	,,	908·03	159 14	,,	...	...
Dec. 5·37	3 7 2	−2·19	+6·91	+17·315	1243·12	159 50	+16·247	1954·85	330 34
·38	3 21 28	2·66	6·86	,,	1246·67	159 51	,,	1951·42	330 32
·39	3 35 55	3·12	6·81	,,	1250·24	159 52	,,	1947·97	330 31
·40	3 50 21	3·56	6·75	,,	1253·82	159 53	,,	1944·50	330 29
·41	4 4 48	4·00	6·68	,,	1257·41	159 54	,,	1941·02	330 27
·42	4 19 14	4·41	6·60	,,	1261·01	159 55	,,	1937·53	330 25
·43	4 33 41	−4·81	+6·52	,,	1264·62	159 56	,,	1934·02	330 24
Dec. 6·36	2 56 32	−1·82	+6·88	+17·315	1605·51	159 9	+16·247	1594·74	329 9
·37	3 10 58	2·29	6·84	,,	1609·03	159 9	,,	1591·29	329 7
·38	3 25 25	2·75	6·80	,,	1612·56	159 9	,,	1587·83	329 6
·39	3 39 51	−3·21	+6·75	,,	1616·11	159 10	,,	..	...

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Date, Greenwich Mean Time.	Cape Sidereal Time.	Parallax. In R.A.	Parallax. In Dec.	Comparison Star.	Computed Distance.	Computed Position-Angle.	Comparison Star.	Computed Distance.	Computed Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Dec. 7·37	3 14 55	−2·40	+6·77	+17·315	1973·99	157 42	+16·247	1223·89	328 27
·38	3 29 21	2·85	6·73	,,	1977·51	157 42	,,	1220·39	328 26
·39	3 43 48	3·30	6·67	,,	1981·05	157 42	,,	1216·86	328 25
·40	3 58 14	3·73	6·60	,,	1984·61	157 41	,,	1213·32	328 24
·41	4 12 41	4·15	6·53	,,	1988·17	157 41	,,	1209·77	328 23
·42	4 27 7	4·55	6·46	,,	1991·74	157 41	,,	1206·21	328 22
·43	4 41 34	−4·94	+6·38	,,	1995·33	157 40	,,	...	...
Dec. 8·36	3 4 25	−2·03	+6·74	+16·247	855·58	329 34	...	...	...
·37	3 18 51	2·49	6·70	,,	852·03	329 34	...	...	...
·38	3 33 18	2·94	6·66	,,	848·47	329 34	...	...	...
·39	3 47 44	3·39	6·60	,,	844·90	329 34	...	...	...
·40	4 2 11	3·81	6·53	,,	841·31	329 34	...	...	...
·41	4 16 37	4·23	6·46	,,	837·72	329 34	...	...	...
·42	4 31 4	−4·62	+6·38	,,	834·11	329 34	...	...	...
Dec. 9·38	3 37 14	−3·04	+6·58	+16·247	476·60	336 40	...	...	...
·39	3 51 40	3·47	6·52	,,	473·07	336 46	...	...	...
·40	4 6 7	3·89	6·46	,,	469·52	336 52	...	...	...
·41	4 20 33	4·30	6·39	,,	465·96	336 59	...	...	...
·42	4 35 0	−4·68	+6·31	,,	462·39	337 6	...	...	...
Dec. 10·36	3 12 18	−2·23	+6·61	+16·247	181·89	25 50 4	...	...	...
·37	3 26 44	2·68	6·57	,,	180·50	26 55 4	...	...	...
·38	3 41 11	3·12	6·52	,,	179·18	28 1 24	...	...	...
·39	3 55 37	3·55	6·46	,,	177·93	29 9 1	...	...	...
·40	4 10 4	3·96	6·39	,,	176·75	30 17 54	...	...	...
·41	4 24 30	4·35	6·32	,,	...	31 28 2	...	...	...
·42	4 38 57	4·73	6·24	,,	...	32 39 24	...	...	...
·43	4 53 23	5·09	6·15	,,	...	33 51 59	...	...	...
·44	5 7 50	5·43	6·06	,,	...	35 5 44	...	...	...
·45	5 22 16	5·74	5·96	,,	...	36 20 36	...	...	...
·46	5 36 42	−6·04	+5·86	,,	...	37 36 31	...	...	...

Computed Distances and Position-Angles.—Leipzig.

	Leipzig Sid. Time.								
Oct. 18·26	20 54 36	+6·87	−6·93	+24·358	5117·02	149 53	+22·372	...	..
·27	21 9 2	6·81	6·77	,,	5116·83	149 57	,,	4257·23	322 58
·28	21 23 29	6·71	6·61	,,	5116·64	150 2	,,	4258·27	322 53
·29	21 37 55	6·60	6·46	,,	5116·46	150 7	,,	4259·33	322 48
·30	21 52 22	6·45	6·31	,,	5116·27	150 11	,,	4260·41	322 43
·31	22 6 48	6·28	6·16	,,	5116·10	150 15	,,	4261·51	322 37
·32	22 21 14	6·09	6·02	,,	5115·93	150 20	,,	4262·64	322 32
·33	22 35 41	5·86	5·88	,,	5115·74	150 24	,,	4263·78	322 26
·34	22 50 7	5·62	5·75	,,	5115·54	150 29	,,	4264·95	322 21
·35	23 4 34	5·35	5·62	,,	5115·37	150 33	,,	4266·13	322 16
·36	23 19 0	+5·07	−5·50	,,	5115·18	150·38	,,	..	...

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Date, Greenwich Mean Time.	Leipzig Sidereal Time.	Parallax.		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Oct. 24·24	20 49 23	+6·95	−7·10	+22·354	311·78	193 27 22	...	...	...
·25	21 3 49	6·89	6·93	,,	317·29	194 26 25	...	...	...
·26	21 18 16	6·80	6·77	,,	322·90	195 23 44	...	...	...
·27	21 32 42	6·68	6·62	,,	328·60	196 19 22	...	...	...
·28	21 47 9	6·53	6·48	,,	334·40	197 13 19	...	...	...
·29	22 1 35	6·36	6·33	,,	340·30	198 5 39	...	...	...
·30	22 16 2	6·16	6·19	,,	346·28	198 56 22	...	...	...
·31	22 30 28	+5·94	−6·05	,,	352·35	199 45 34	...	...	...
Oct. 25·24	20 53 19	+6·94	−7·06	+22·347	1792·11	38 9 38	+22·354	...	...
·25	21 7 46	6·87	6·90	,,	1784·77	38 4 32	,,	...	...
·26	21 22 13	6·77	6·75	,,	1777·40	37 59 21	,,	1046·40	225 8 17
·27	21 36 39	6·64	6·60	,,	...	...	,,	1054·13	225 14 3
·28	21 51 6	6·48	6·45	,,	...	...	,,	1061·87	225 19 46
·29	22 5 32	6·30	6·31	,,	1755·07	37 43 17	,,	1069·64	225 25 27
·30	22 19 59	6·10	6·17	,,	1747·60	37 37 46	,,	...	...
·31	22 34 24	+5·87	−6·03	,,	1740·10	37 32 11	,,	...	...
Oct. 26·23	20 42 50	+6·99	−7·19	+22·347	1072·91	24 49 57	...	...	...
·24	20 57 16	6·93	7·03	,,	1066·19	24 36 7	...	...	...
·25	21 11 43	6·84	6·87	,,	1059·48	24 22 4	...	...	...
·26	21 26 9	6·73	6·72	,,	1052·76	24 7 43	...	...	...
·27	21 40 35	6·60	6·57	,,	1046·05	23 53 9	...	...	...
·28	21 55 2	6·43	6·42	,,	1039·35	23 38 19	...	...	...
·29	22 9 28	+6·24	−6·28	,,	1032·65	23 23 13	...	...	...
Oct. 28·21	20 21 50	+7·03	−7·42	+20·404	5464·20	328 49	+22·331	...	...
·22	20 36 16	7·00	7·27	,,	5463·85	328 44	,,	4310·08	115 52
·23	20 50 43	6·95	7·11	,,	5463·52	328 39	,,	4305·99	115 57
·24	21 5 9	6·88	6·96	,,	5463·20	328 34	,,	4301·89	116 3
·25	21 18 35	6·78	6·81	,,	5462·91	328 28	,,	4297·78	116 8
·26	21 34 2	6·65	6·66	,,	5462·64	328 23	,,	4293·67	116 14
·27	21 48 28	6·50	6·51	,,	5462·39	328 18	,,	4289·54	116 20
·28	22 2 54	6·32	6·37	,,	5462·17	328 13	,,	4285·41	116 26
·29	22 17 21	6·11	6·23	,,	5461·97	328 7	,,	4281·27	116 32
·30	22 31 47	5·88	6·10	,,	5461·78	328 2	,,	4277·13	116 37
·31	22 46 13	5·63	5·98	,,	5461·62	327 57	,,	4272·97	116 43
·32	23 0 40	+5·36	−5·86	,,	5461·48	327 52	,,	...	...
Nov. 5·19	20 24 30	+6·94	−7·38	+21·321	879·10	117 54 40	...	...	...
·20	20 38 56	6·91	7·23	,,	875·88	118 24 37	...	...	...
·21	20 53 23	6·84	7·09	,,	872·72	118 54 51	...	...	...
·22	21 7 49	6·76	6·94	,,	869·60	119 25 21	...	...	...
·23	21 22 15	6·64	6·80	,,	866·52	119 56 8	...	...	...
·24	21 36 42	6·50	6·66	,,	863·50	120 27 11	.	...	...
·25	21 51 8	6·33	6·52	,,	860·53	120 58 31	...	...	...
·26	22 5 35	6·13	6·39	,,	857·62	121 30 8	...	...	...
·27	22 20 1	+5·91	−6·26	,,	854·76	122 2 1	...	...	..

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Date, Greenwich Mean Time.	Leipzig Sidereal Time.	Parallax. In R.A.	Parallax. In Dec.	Comparison Star.	Computed Distance.	Computed Position-Angle.	Comparison Star.	Computed Distance.	Computed Position-Angle.
1888	h m s	″	″	°	″	° ′	°	″	° ′
Nov. 7·19	20 32 23	+6·89·	−7·28·	+19·340	5699·61·	358 24	+21·304	...	..
·20	20 46 49	6·84	7·14	,,	5694·48·	358 20	,,	4838·94	148 17
·21	21 1 16	6·76	6·99·	,,	5689·36·	358 16	,,	4840·20	148 23
·22	21 15 43	6·65·	6·85·	,,	5684·25	358 12	,,	4841·46	148 28
·23	21 30 9	6·52	6·71·	,,	5679·14	358 8	,,	4842·72·	148 34
·24	21 44 35	+6·36	−6·57·	,,	5674·04	358 4	,,	...	...
Nov. 8·18	20 21 53	+6·92	−7·38	+21·304	5044·23	157 16	+19·340	...	...
·19	20 36 19	6·86·	7·23·	,,	5046·82	157 21	,,	5208·35	351 28
·20	20 50 46	6·79·	7·09	,,	5049·42	157 26	,,	5203·99	351 24
·21	21 5 12	6·71	6·95	,,	5052·02·	157 31	,,	5199·63	351 19
·22	21 19 39	6·59·	6·81	,,	5054·64·	157 36	,,	5195·29	351 14
·23	21 34 5	6·45·	6·67·	,,	5057·25	157 42	,,	5190·95	351 10
·24	21 48 32	6·28·	6·54	,,	5059·87	157 48	,,	5186·63	351 5
·25	22 2 58	6·09·	6·41	,,	5062·50·	157 53	,,	5182·31	351 0
·26	22 17 24	5·88	6·28·	,,	5065·14	157 58	,,	5178·00	350 55
·27	22 31 50	+5·65	−6·16	,,	5067·78	158 3	,,	...	...
Nov. 9·18	20 25 50	+6·87	−7·32	+19·340	4805·27	343 29	+21·304	...	...
·19	20 40 16	6·82	7·18	,,	4801·79	343 24	,,	5379·27·	165 27
·20	20 54 43	6·75	7·04	,,	4798·34	343 18	,,	5382·98	165 31
·21	21 9 9	6·65·	6·90	,,	4794·91·	343 13	,,	5386·69·	165 36
·22	21 23 35	6·53	6·76·	,,	4791·51·	343 8	,,	5390·41·	165 40
·23	21 38 2	6·38	6·63	,,	4788·14·	343 3	,,	5394·14	165 45
·24	21 52 28	6·20·	6·50	,,	4784·79·	342 58	,,	5397·87·	165 50
·25	22 6 55	6·01	6·37	,,	4781·44·	342 53	,,	5401·61·	165 54
·26	22 21 21	5·78·	6·25	,,	4778·10	342 47	,,	5405·37	165 59
·27	22 35 47	+5·54	−6·13	,,	4774·77	342 42	,,	...	...
Nov. 10·17	20 15 20	+6·86	−7·41	+20·341	3979·03	107·50	+19·340	...	...
·18	20 29 46	6·83	7·27	,,	3975·25	107·56	,,	4500·08·	334 21
·19	20 44 13	6·78	7·13	,,	3971·46	108 2	,,	4497·75·	334 16
·20	20 58 39	6·70	6·99	,,	3967·66	108 8	,,	4495·44·	334 10
·21	21 13 5	6·59·	6·85·	,,	3963·85	108 14	,,	4493·16	334 4
·22	21 27 32	6·46·	6·72	,,	3960·03·	108 20	,,	4490·89·	333 58
·23	21 41 58	+ 6·33·	− 6·58·	,,	...	...	,,	...	...
Nov. 11·18	20 33 43	+6·79	−7·21·	+19·340	4313·03·	324 23	+20·341	...	...
·19	20 48 9	6·73	7·07·	,,	4311·93·	324 15	,,	3677·31·	118 57
·20	21 2 36	6·64·	6·94	,,	4310·87	324 10	,,	3675·04·	119 4
·21	21 17 2	6·53·	6·80	,,	4309·84	324 4	,,	3672·77	119 10
·22	21 31 28	6·39	6·67	,,	4308·82	323 58	,,	3670·49	119 17
·23	21 45 55	6·23	6·54	,,	4307·82·	323 52	,,	3668·21	119 23
·24	22 0 21	6·04	6·41·	,,	4306·85·	323 46	,,	3665·93	119 29
·25	22 14 47	+ 5·82·	−6·29	,,	4305·91·	323 39	,,	...	...

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Date, Greenwich Mean Time.	Leipzig Sidereal Time.	Parallax.		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Nov. 12·17	20 23 13	+ 6·80	—7·30	+20·341	3551·06	130 48	+19·340	...	...
·18	20 37 39	6·75	7·16	"	3550·52	130 54	"	4252·39	314 2
·19	20 52 6	6·68	7·02	"	3549·98·	131 1	"	4252·57	313 56
·20	21 6 32	6·58·	6·88·	"	3549·45	131 8	"	4252·77	313 50
·21	21 20 58	6·46·	6·75·	"	3548·91	131 15	"	4253·00	313 43
·22	21 35 25	6·32	6·62·	"	3548·37·	131 23	"	4253·26	313 37
·23	21 49 51	6·15	6·49·	"	3547·84·	131 30	"	4253·54·	313 31
·24	22 4 17	5·95·	6·37	"	3547·32·	131 38	"	4253·86	313 25
·25	22 18 44	5·73·	6·25·	"	3546·80	131 45	"	4254·19·	313 19
·26	22 33 10	+5·49	—6·14·	"	3546·28	131 52	"	...	...
Nov. 14·17	20 31 6	+6·71·	—7·19	+18·283	2959·48	350 39	+20·341	...	...
·18	20 45 32	6·65·	7·05	"	2955·10·	350 32	"	3804·29·	154 2
·19	20 59 59	6·57	6·91·	"	2950·72·	350 25	"	3806·91·	154 8
·20	21 14 25	6·46	6·78·	"	2946·34·	350 19	"	3809·54·	154 14
·21	21 28 51	6·32·	6·65·	"	2941·94·	350 12	"	3812·17·	154 21
·22	21 43 18	6·16·	6·53	"	2937·56	350 5	"	3814·80·	154 27
·23	21 57 44	5·98	6·40·	"	2933·18·	349 58	"	3817·44·	154 32
·24	22 12 10	5·77	6·29	"	2928·82·	349 51	"	3820·10	154 39
·25	22 26 37	5·53·	6·17·	"	2924·48	349 44	"	...	...
·26	22 41 3	+5·28	—6·06	"	2920·15	349 37	"	...	...
Nov. 15·17	20 35 3	+6·67	—7·12	+20·341	4134·99	163 13	+18·283	...	...
·18	20 49 29	6·60	6·99	"	4138·68	163 18	"	...	...
·19	21 3 56	6·51	6·86	"	4142·38·	163 23	"	2557·15	337 41
·20	21 18 22	6·39·	6·73	"	4146·10·	163 28	"	2554·08	337 33
·21	21 32 48	6·25	6·60·	"	4149·83	163 33	"	2551·02·	337 24
·22	21 47 14	6·08	6·49	"	4153·56	163 38	"	2547·99·	337 16
·23	22 1 41	5·89	6·36	"	4157·29	163 43	"	2545·00	337 7
·24	22 16 7	5·67·	6·24·	"	4161·02·	163 48	"	2542·02	336 58
·25	22 30 33	+5·43·	—6·13	"	4164·77	163 53	"	...	...
Nov. 17·17	20 42 56	+6·56	—7·00	+18·283	2261·57	305 8	+20·341	...	...
·18	20 57 22	6·48·	6·87·	"	2262·09	304 57	"	2145·90	129 0
·19	21 11 49	6·38	6·75	"	2262·65	304 46	"	2145·84	129 10
·20	21 26 15	6·24·	6·62·	"	2263·23·	304 36	"	2145·80·	129 21
·21	21 40 41	6·09	6·50·	"	2263·85	304 26	"	2145·79	129 32
·22	21 55 8	5·91	6·38·	"	2264·51·	304 16	"	2145·77·	129 43
·23	22 9 34	5·70·	6·27	"	2265·21	304 5	"	2145·77	129 54
·24	22 24 0	+5·47·	—6·16	"	2265·94	303 55	"	2145·77	130 5
Nov. 18·17	20 46 52	+6·51	—6·94·	+18·277	1290·91	22 13 50	...	...	...
·18	21 1 18	6·42	6·82	"	1284·63	22 9 7	...	...	...
·19	21 15 45	6·31	6·69·	"	1278·34	22 4 17	...	...	...
·20	21 30 11	6·17	6·58	"	1272·04	21 59 21	...	...	...
·21	21 44 37	6·00·	6·45	"	1265·74	21 54 18	...	...	...
·22	21 59 4	5·82	6·33·	"	1259·43	21 49 11	...	...	...
·23	22 13 30	+5·62·	—6·21	"	1253·11	21 44 0	...	...	...

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Date, Greenwich Mean Time.	Leipzig Sidereal Time.	Parallax.		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Nov. 29·16	21 15 48	+5·86	−6·39	+17·315	1241·65	12 17 59	...	...	...
·17	21 30 14	5·73	6·28	,,	1237·46	12 18 6	...	...	...
·18	21 44 41	5·57	6·18	,,	1233·25	12 18 11	...	...	...
·19	21 59 7	5·39	6·08	,,	1229·02	12 18 15	...	...	...
·20	22 13 33	5·19	5·98	,,	1224·77	12 18 16	...	...	...
·21	22 28 0	4·97	5·88	,,	1220·50	12 18 14	...	...	...
·22	22 42 26	+4·73	−5·79	,,	1216·23	12 18 9	...	...	...
Dec. 3·17	21 46 1	+5·40	−6·04	+17·315	454·44	149 13 30	...	...	...
·18	22 0 27	5·22	5·95	,,	457·78	149 24 54	...	...	...
·19	22 14 54	5·02	5·85	,,	461·11	149 36 15	...	...	...
·20	22 29 20	4·81	5·76	,,	464·44	149 47 33	...	...	...
·21	22 43 46	4·57	5·68	,,	467·78	149 58 48	...	...	...
·22	22 58 13	4·31	5·60	,,	471·11	150 9 59	...	...	...
·23	23 12 39	+4·05	−5·52	,,	474·45	150 21 7	...	...	...
Dec. 5·15	21 25 1	+5·56	−6·12	+17·315	1177·17	159 41 16	...	...	...
·16	21 39 27	5·40	6·02	,,	1180·71	159 41 46	...	...	...
·17	21 53 54	5·23	5·92	,,	1184·24	159 42 18	...	...	...
·18	22 8 20	5·04	5·83	,,	1187·76	159 42 52	...	...	...
·19	22 22 46	4·84	5·74	,,	1191·28	159 43 28	...	...	...
·20	22 37 13	4·62	5·66	,,	1194·79	159 44 6	...	...	...
·21	22 51 39	+4·37	−5·58	,,	1198·31	159 44 49	...	...	...
Dec. 6·15	21 28 58	+5·46	−6·05	+17·315	1543·35	159 18	+16·247	1656·67	329 23
·16	21 43 24	5·31	5·96	,,	1546·87	159 18	,,	1653·18	329 22
·17	21 57 51	5·15	5·86	,,	1550·38	159 17	,,	1649·70	329 21
·18	22 12 17	4·96	5·77	,,	1553·88	159 17	,,	1646·22	329 20
·19	22 26 43	4·75	5·69	,,	1557·39	159 17	,,	1642·75	329 19
·20	22 41 10	4·52	5·61	,,	1560·88	159 17	,,	1639·29	329 18
·21	22 55 36	4·27	5·53	,,	1554·38	159 16	,,	1635·83	329 17
·22	23 10 2	+4·01	−5·45	,,	1567·88	159 16	,,	...	...
Dec. 7·15	21 32 54	+5·38	−5·99	+16·247	1290·33	328 29	+17·315	...	...
·16	21 47 20	5·23	5·90	,,	1286·80	328 28	,,	1911·83	157 59
·17	22 1 47	5·06	5·81	,,	1283·28	328 28	,,	1915·34	157 59
·18	22 16 13	4·86	5·72	,,	1279·77	328 27	,,	1918·84	157 58
·19	22 30 39	4·65	5·62	,,	1276·25	328 27	,,	1922·33	157 57
·20	22 45 6	4·42	5·55	,,	1272·75	328 26	,,	1925·81	157 57
·21	22 59 32	+4·17	−5·48	,,	1269·25	328 26	,,	...	...
Dec. 8·15	21 36 51	+5·30	−5·93	+16·247	919·49	329 3 13	...	...	...
·16	22 51 17	5·15	5·84	,,	915·92	329 4 5	...	...	...
·17	22 5 43	4·97	5·75	,,	912·35	329 4 53	...	...	...
·18	22 20 10	4·77	5·66	,,	908·78	329 5 37	...	...	...
·19	22 34 36	+4·55	−5·58	,,	905·21	329 6 17	...	...	...

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1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Dec. 13·15	21 56 33	+4·91	−5·62	+16·247	1153·23	118 37 53	...	...	...
·16	22 10 59	4·73	5·54	„	1157·45	118 38 37	...	...	...
·17	22 25 26	4·54	5·46	„	1161·65	118 39 22	...	...	...
·18	22 39 53	4·33	5·39	„	1165·85	118 40 9	...	...	...
·19	22 54 19	+4·10	−5·31	„	1170·03	118 40 57	...	...	...

Computed Distances and Position-Angles.—Oxford.

	Oxford Sid. Time.								
Oct. 30·34	22 42 48	+5·60	−6·09	+22·331	3797·71	139 48	+20·404	...	...
·36	23 11 41	5·05	5·85	„	3796·09	140 3	„	...	...
·38	23 40 33	4·40	5·65	„	3794·51	140 18	„	...	...
·40	0 9 26	3·69	5·47	„	3793·00	140 34	„	5637·85	309 57
·42	0 38 19	2·92	5·32	„	...	...	„	5642·61	309 47
·44	1 7 12	2·10	5·21	„	...	...	„	5647·42	309 37
·46	1 36 4	1·26	5·14	„	...	...	„	5652·27	309 27
·48	2 4 57	+0·39	5·10	„	...	...	„	5657·17	309 17
·50	2 33 50	−0·48	5·10	„	...	...	„	5662·08	309 7
·52	3 2 43	1·36	5·14	„	3785·41	142 8	„	5667·01	308 57
·54	3 31 35	2·20	5·22	„	3784·60	142 24	„	...	...
·56	4 0 28	−3·01	−5·34	„	3783·92	142 40	„	...	...
Nov. 13·28	22 11 22	+5·77	−6·35	+20·341	3610·12	144 11	+19·340	...	...
·30	22 40 15	5·27	6·13	„	3612·65	144 25	„	...	...
·32	23 9 17	4·71	5·93	„	3615·23	144 39	„	...	...
·34	23 38 0	4·07	5·75	„	3617·85	144 54	„	4339·12	302 20
·36	0 6 53	3·37	5·59	„	...	...	„	4342·57	302 8
·38	0 35 46	2·62	5·47	„	...	...	„	4346·07	301 56
·40	1 4 38	1·81	5·39	„	...	...	„	4349·65	301 44
·42	1 33 31	0·99	5·33	„	...	...	„	4353·26	301 32
·44	2 2 24	+0·15	5·30	„	...	...	„	4356·92	301 21
·46	2 31 17	−0·70	5·31	„	3635·00	146 19	„	4360·62	301 9
·48	3 0 9	1·53	5·36	„	3638·17	146 34	„	...	...
·50	3 29 2	−2·34	−5·44	„	3641·43	146 48	„	...	...
Nov. 16·34	23 49 50	+3·70	−5·66	+19·329	2204·56	113 20	+18·283	...	...
·36	0 18 43	2·98	5·53	„	2200·15	113 42	„	...	...
·38	0 47 35	2·21	5·44	„	2195·79	114 3	„	2295·57	318 43
·40	1 16 28	1·41	5·35	„	...	...	„	2293·93	318 22
·42	1 45 21	+0·59	5·32	„	...	...	„	2292·34	318 1
·44	2 14 14	−0·24	5·31	„	...	...	„	2290·81	317 39
·46	2 43 6	1·07	5·34	„	...	...	„	2289·32	317 18
·48	3 11 59	1·88	5·40	„	2175·41	115 51	„	2287·90	316 56
·50	3 40 52	2·67	5·49	„	2171·69	116 13	„	...	...
·52	4 9 45	3·40	5·61	„	2168·12	116 35	„	...	...
·54	4 38 38	−4·09	−5·76	„	2164·72	116 57	„	...	...

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1888	h m s	″	″	°	″	° ′ ″	°	′	° ′ ″
Nov. 20·31	23 22 17	+4·21	−5·79	+18·277	306·30·	285 34 2	...	...	...
·33	23 51 9	3·56	5·63	„	310·88	283 24 39	...	...	...
·35	0 20 2	2·83	5·51	„	315·93·	281 18 40	...	...	...
·37	[illegible] 48 55	+2·09	5·42	„	321·40	279 16 32	...	...	...
·48	3 27 46	−2·31	5·44	„	358·01·	269 16 16	...	...	...
·50	3 56 39	3·04	5·55	„	365·60·	267 39 51	...	...	...
·52	4 25 31	3·75	5·67	„	373·44	266 7 23	...	...	...
·54	4 54 24	−4·39	−5·84	„	381·46	264 38 15	...	...	...
Dec. 6·30	0 10 56	+2·72	−5·24	+16·247	1604·85	329 9 8	...	...	...
·32	0 39 48	2·06	5·15	„	1597·91·	329 6 24	...	...	...
·34	1 8 41	1·36	5·09	„	1590·95	329 3 41	...	...	...
·36	1 37 34	+0·63	5·05	„	1583·96·	329 0 55	...	...	...
·56	6 26 21	−5·33	6·02	„	1512·37·	328 34 29	...	...	...
·58	6 55 14	5·57	6·21	„	1504·98	328 32 31	...	...	...
·60	7 24 7	5·74	6·41	„	1497·58	328 30 41	...	...	...
·62	7 53 0	−5·81	−6·54	„	1490·18	328 29 9	...	...	...
Dec. 9·34	1 20 31	+1·04	−5·13	+16·247	478·94·	335 57 52	...	...	...
·36	1 49 24	+0·33	5·10	„	471·92	336 10 29	...	...	..
·38	2 18 17	−0·38	5·10	„	464·87·	336 23 31	...	...	...
·40	2 47 9	1·08	5·12	„	457·82	336 37 1	...	...	...
·42	3 16 2	1·77	5·17	„	450·73·	336 51 3	...	...	...
·44	3 44 55	2·43	5·25	„	443·62·	337 5 46	...	...	...
·46	4 13 48	−3·05	−5·34	„	436·50	337 21 18	...	...	...

Computed Distances and Position-Angles.—Yale.

	N.H. Sid. Time.								
Oct. 10·55	21 40 34	+7·73	−5·09·	+24·376	1169·03	104 42 0	...	...	...
·56	21 55 0	7·57	4·82·	„	1165·30·	104 50 23	...	...	...
·57	22 9 27	7·37·	4·65	„	1161·56·	104 58 52	...	...	...
·58	22 23 53	7·15	4·48	„	1157·80·	105 7 27	...	...	...
·59	22 38 19	+6·89·	−4·31·	„	1154·02·	105 16 9	...	...	...
Oct. 10·91	6 20 23	−6·81	−4·27	+24·376	1033·65·	110 53 17	...	...	...
·92	6 34 49	7·07·	4·43	„	1030·24·	111 5 32	...	...	...
·93	6 49 16	7·31·	4·60	„	1026·87	111 17 52	...	...	...
·94	7 3 42	−7·52	−4·77·	„	1023·53·	111 30 16	...	...	...
Oct. 11·54	21 30 4	+7·86·	−5·16	+24·376	866·31	125 24 39	...	...	...
·55	21 44 30	7·72	4·97·	„	863·76	125 41 35	...	...	...
·56	21 58 57	7·54·	4·80	„	861·22·	125 58 38	...	...	...
·61	23 11 9	6·23·	3·98·	„	848·54	127 26 57	...	...	...
·62	23 25 35	5·89	3·84·	„	846·03	127 45 12	...	...	...
·63	23 40 1	+5·52·	−3·71	„	843·52	128 3 39	...	...	...

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		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′	°	″	° ′
Oct. 15·70	1 36 52	+1·86	−3·08	+24·358	5382·91·	132 26	+22·372	4347·19·	344 51
·71	1 51 18	1·35	3·04	"	5380·57·	132 30	"	4345·97·	344 46
·72	2 5 45	0·83·	3·01·	"	5378·26·	132 34	"	4344·75·	344 41
·73	2 20 11	+0·31·	−3·00·	"	5375·98·	132 38	"	4343·53·	344 36
Oct. 16·54	21 49 47	+7·77	−5·01	+22·372	4253·42	338 7	+24·358	...	...
·55	22 4 13	7·57	4·83	"	4252·90·	338 2	"	5243·93	137 48
·56	22 18 39	7·34·	4·66	"	4252·41	337 57	"	5242·26	137 52
·57	22 33 6	7·09	4·49·	"	4251·93	337 52	"	5240·57·	137 55
·58	22 47 32	6·80	4·33	"	4251·45·	337 47	"	5238·86·	138 0
·59	23 1 59	6·49	4·18	"	4250·98·	337 41	"	...	...
·67	0 57 29	3·20	3·26·	"	4247·63	336 59	"	5223·64	138 37
·68	1 11 56	2·71	3·19·	"	4247·23	336 53	"	5221·97	138 41
·69	1 26 22	+2·21	−3·14	"	4246·84	336 48	"	5220·30	138 45
Oct. 16·59	23 1 59	+6·49	−4·18	+24·376	2554·04	224 50	+22·354	...	...
·60	23 16 25	6·15·	4·03	"	2560·14	224 53	"	...	...
·61	23 30 51	5·80	3·89·	"	2566·28	224 56	"	5175·97·	61 30
·62	23 45 18	5·41	3·77·	"	2572·45	224 58	"	5169·48	61 30
·63	23 59 44	+5·00·	−3·64·	"	2578·64·	225 1	"	5162·95	61 30
Oct. 17·53	21 39 17	+7·90·	−5·16	+24·358	5141·42·	144 33	+22·372	4221·66	329 34
·54	21 53 43	7·73	4·98	"	5140·53	144 37	"	4222·04	329 29
·55	22 8 10	7·52·	4·80	"	5139·63	144 41	"	4222·44	329 24
·56	22 22 36	7·28·	4·63	"	5138·72·	144 45	"	4222·85	329 18
·57	22 37 2	7·02	4·47	"	5137·82	144 50	"	...	...
·61	23 34 48	5·68·	3·87·	"	5134·16·	145 8	"	4225·17·	328 51
·62	23 49 14	5·29·	3·75	"	5133·27·	145 12	"	4225·68·	328 46
·63	0 3 41	+4·88·	−3·63·	"	5132·39	145 17	"	4226·21	328 40
Oct. 17·57	22 37 2	+7·02	−4·47	+24·376	3158·24	227 57	+22·354	4565·57	61 37
·58	22 51 28	6·72·	4·31	"	3164·66·	227 58	"	4558·92	61 37
·59	23 5 55	6·40·	4·15·	"	3171·11	228 0	"	4552·25	61 37
·60	23 20 21	6·06	4·01·	"	3177·58	228 2	"	4545·55	61 36
·61	23 34 48	5·68·	3·87·	"	3184·07	228 4	"	4538·82	61 36
·62	23 49 14	+5·29·	−3·75	"	3190·59	228 6	"	4532·07	61 36
Oct. 17·85	5 21 20	−5·71·	−3·89	+22·354	4373·13	61 35	+24·376	3344·83·	228 46
·86	5 35 47	6·09	4·03	"	4366·22·	61 35	"	3351·59	228 47
·87	5 50 13	6·43	4·17·	"	4359·33·	61 35	"	3358·33·	228 49
·88	6 4 40	6·75	4·32·	"	4352·45·	61 35	"	3365·07	228 51
·89	6 19 6	7·04·	4·48·	"	4345·59	61 35	"	3371·79	228 52
·90	6 33 33	7·31	4·65	"	4338·73·	61 35	"	3378·50	228 53
·91	6 47 59	7·54·	4·82·	"	4331·91·	61 35	"	3385·20	228 54
·92	7 2 26	−7·75	−5·00	"	4325·11·	61 35	"	3391·89·	228 56

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1888	h m s	″	″	°	″	° ′	°	″	° ′
Oct. 18·52	21 28 47	+8·02·	−5·31	+22·372	4282·20·	320 47	+24·358	5118·59·	151 48
·53	21 43 13	7·87·	5·13	"	4283·54·	320 41	"	5118·59	151 53
·54	21 57 40	7·69	4·95	"	4284·90·	320 36	"	5118·58·	151 57
·55	22 12 6	7·47	4·77·	"	4286·29	320 31	"	5118·57·	152 1
·60	23 24 18	5·96·	4·00	"	4293·59	320 4	"	5118·58	152 24
·61	23 38 45	5·58	3·86·	"	4295·09·	319 58	"	5118·60	152 29
·62	23 53 11	+5·18	−3·74	"	4296·62·	319 53	"	5118·63	152 34
Oct. 18·55	22 12 6	+7·47	−4·77·	+24·376	3791·55·	230 2	+22·354	...	...
·56	22 26 33	7·22·	4·60·	"	3798·22·	230 3	"	3912·89·	61 50
·57	22 40 59	6·94·	4·44·	"	3804·91·	230 4	"	3906·03·	61 50
·58	22 55 26	6·64	4·28·	"	3811·63·	230 6	"	3899·15·	61 50
·59	23 9 52	+6·31	−4·13·	"	3818·37·	230 7	"	3892·25	61 50
Oct. 18·86	5 39 44	−6·21·	−4·10	+22·354	3700·18	61 50	+24·376	...	...
·87	5 54 10	6·55·	4·25	"	3693·06·	61 50	"	4013·60	230 41
·88	6 8 37	6·86·	4·40·	"	3685·97·	61 50	"	4020·59·	230 42
·89	6 23 3	7·15	4·56·	"	3678·90	61 50	"	4027·58·	230 43
·90	6 37 29	7·41	4·73·	"	3671·84	61 51	"	4034·56·	230 44
·91	6 51 55	−7·63·	−4·90·	"	3664·80	61 51	"	...	...
Oct. 20·86	5 47 36	−6·47	−4·24·	+24·376	5390·05·	232 55	+22·354	...	...
·87	6 2 3	6·79	4·39·	"	5397·51·	232 55	"	2298·64·	63 18
·88	6 16 29	7·08·	4·55·	"	5404·96·	232 56	"	2291·18·	63 19
·89	6 30 56	7·35	4·72	"	5412·40·	232 56	"	2283·73	63 20
·90	6 45 23	7·60	4·89	"	5419·83	232 57	"	2276·29	63 21
·91	6 59 49	7·80	5·07	"	5427·23·	232 57	"	2268·87·	63 22
·92	7 14 15	−7·97·	−5·24·	"	5434·61·	232 58	"	2261·48·	63 23
Oct. 21·52	21 40 37	+7·93	−5·20	+23·326	4178·42·	144 14	+22·368	...	...
·53	21 55 3	7·74·	5·02·	"	4177·63·	144 20	"	3825·96·	311 55
·54	22 9 30	7·52·	4·85	"	4176·85·	144 26	"	3828·35·	311 49
·55	22 23 56	7·28	4·68	"	4176·08·	144 32	"	3830·78	311 43
·56	22 38 22	7·00·	4·52	"	4175·31·	144 38	"	3833·23	311 36
·57	22 52 49	6·69·	4·36	"	4174·54·	144 44	"	3835·70·	311 30
·58	23 7 15	6·36·	4·21	"	4173·78	144 50	"	3838·20·	311 24
·59	23 21 41	+6·01	−4·07·	"	4173·02	144 56	"	...	...
Oct. 21·60	23 36 8	+5·63	−3·94	+24·376	5914·66·	233 23	+22·354	1782·12	64 48
·61	23 50 34	5·22·	3·81·	"	5922·16·	233 23	"	1774·53	64 49
·62	0 5 1	4·80	3·70	"	5929·69·	233 24		1766·94	64 50
·63	0 19 27	4·36	3·60	"	5937·25	233 24	"	1759·35	64 51
·64	0 33 53	+3·90	−3·50	"	5944·82·	233 25	"	1751·76	64 53

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1888	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Oct. 21·84	5 22 41	−5·75·	−4·03	+22·354	...	...	+24·376	...	...
·85	5 37 7	6·24·	4·17	,,	1589·83	65 22	,,	6106·25·	233 36
·86	5 51 34	6·58·	4·31·	,,	1582·17·	65 24	,,	6113·94	233 36
·87	6 6 0	6·90	4·46	,,	1574·54	65 26	,,	6121·60	233 37
·88	6 20 26	7·19	4·63	,,	1566·92	65 28	,,	6129·24·	233 37
·89	6 34 53	7·45	4·80	,,	1559·32	65 30	,,	6136·87	233 37
·90	6 49 19	−7·67	−4·97	,,	1551·75	65 33	,,	...	...
Oct. 24·53	22 6 53	+7·56·	−4·92	+22·354	497·53	211 41 13	...	...	...
·54	22 21 19	7·31·	4·75	,,	504·56·	212 5 56	...	...	...
·55	22 35 46	7·03·	4·59	,,	511·64·	212 30 4	...	...	...
·56	22 50 12	6·73	4·43·	,,	518·77	212 53 39	...	...	...
·57	23 4 38	+6·40	−4·28·	,,	525·94	213 16 44	...	...	...
Oct. 24·86	6 3 23	−6·92	−4·53·	+22·354	747·44·	221 3 50	...	...	...
·87	6 17 49	7·21	4·69·	,,	755·29	221 14 1	...	...	...
·88	6 32 16	7·47·	4·86	,,	763·13	221 23 53	...	...	...
·89	6 46 42	7·70	5·03	,,	770·96·	221 33 26	...	...	...
·90	7 1 8	7·90·	5·20·	,,	778·79	221 42 40	...	...	...
·91	7 15 35	−8·07	−5·38·	,,	786·60	221 51 37	...	...	...
Oct. 25·52	21 56 23	+7·72	−5·05·	+22·354	1246·89	227 2 46	+22·347	1585·64·	35 35 51
·53	22 10 49	7·49·	4·88·	,,	1254·73·	227 7 8	,,	1578·25·	35 29 4
·54	22 25 16	7·23·	4·72	,,	1262·61·	227 11 27	,,	1570·84·	35 22 11
·55	22 39 42	6·94·	4·56	,,	1270·54	227 15 44	,,	1563·42·	35 15 12
·56	22 54 9	6·63	4·41	,,	1278·49	227 19 57	,,	1555·99	35 8 7
·57	23 8 35	+6·29	−4·26·	,,	1286·46	227 24 11	,,	1548·54	35 0 56
Oct. 25·85	5 52 53	−6·71·	−4·45·	+22·354	1515·94·	229 1 40	+22·347	1337·22·	31 6 12
·86	6 7 19	7·02·	4·61	,,	1524·17	229 4 7	,,	1329·73	30 56 57
·87	6 21 46	7·31	4·77	,,	1532·38	229 6 30	,,	1322·26	30 47 41
·88	6 36 12	−7·56	−4·93·	,,	1540·57·	229 8 49	,,	1314·81·	30 38 23
Oct. 28·61	0 18 10	+4·15·	−3·74	+22·331	4160·25	119 41	+20·404	5457·64	325 21
·62	0 32 36	3·78·	3·65·	,,	4156·36	119 48	,,	5457·94	325 15
·63	0 47 3	3·30	3·57·	,,	4152·47	119 54	,,	5458·24	325 10
·64	1 1 29	2·80·	3·51	,,	4148·59	120 0	,,	5458·55	325 4
·65	1 15 56	2·30·	3·45	,,	4144·72	120 7	,,	5458·86	324 59
·66	1 30 22	+1·78	−3·40·	,,	4140·86	120 13	,,	5459·18	324 54
Oct. 29·51	21 57 43	+7·65·	−5·07·	+22·331	3910·44	129 37	+20·404	5498·71	317 32
·52	22 12 9	7·41·	4·90·	,,	3907·97	129 44	,,	5499·99·	317 27
·53	22 26 36	7·15	4·75	,,	3905·54	129 52	,,	5501·31·	317 22
·54	22 41 2	6·85	4·59·	,,	3903·16	129 59	,,	5502·65·	317 17
·55	22 55 28	+6·53	−4·44·	,,	3900·82·	130 6	,,	...	...

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1888	h m s	″	″	°	″	° ′	°	″	° ′
Oct. 29·55	22 55 28	+6·53	−4·44	+22·347	1873·68	252 14	+21·321	5995·60	59 55
·56	23 9 55	6·18	4·30	,,	1881·87	252 10	,,	5987·11	59 56
·57	23 24 21	5·80	4·17	,,	1890·09	252 6	,,	5978·60	59 56
·58	23 38 48	5·41	4·05	,,	1898·33	252 2	,,	5970·07	59 56
·59	23 53 14	+5·00	−3·93	,,	1906·60	251 58	,,	...	...
Oct. 29·81	5 10 54	−5·76	−4·17	+22·347	2091·50	250 31	+21·321	...	...
·82	5 25 20	6·14	4·30	,,	2099·87	250 27	,,	5761·83	60 4
·83	5 39 47	6·49	4·43	,,	2108·23	250 23	,,	5753·19	60 5
·84	5 54 13	6·82	4·58	,,	2116·58	250 19	,,	5744·56	60 5
·85	6 8 40	7·11	4·73	,,	2124·91	250 15	,,	5735·96	60 6
·86	6 23 6	7·38	4·89	,,	2133·22	250 12	,,	5727·37	60 6
·87	6 37 33	−7·63	−5·06	,,	2141·51	250 8	,,	...	...
Oct. 30·51	22 1 40	+7·57	−5·03	+20·404	5658·47	309 4	+22·331	3790·97	141 54
·52	22 16 6	7·33	4·88	,,	5660·92	309 0	,,	3790·45	142 2
·53	22 30 32	7·05	4·71	,,	5663·39	308 55	,,	3789·95	142 10
·54	22 44 59	6·74	4·52	,,	5665·90	308 50	,,	3789·45	142 17
·55	22 59 25	+6·41	−4·41	,,	5668·43	308 45	,,	3788·96	142 25
Oct. 30·55	22 59 25	+6·41	−4·41	+21·321	5166·09	60 52	+22·347	2680·17	246 40
·56	23 13 51	6·05	4·28	,,	5157·56	60 52	,,	2688·59	246 38
·57	23 28 18	5·67	4·15	,,	5149·01	60 53	,,	2697·04	246 36
·58	23 42 44	5·27	4·03	,,	5140·43	60 53	,,	2705·50	246 34
·59	23 57 10	+4·84	−3·92	,,	5131·83	60 54	,,	2713·99	246 32
Oct. 30·81	5 14 51	−5·89	−4·22	+22·347	2903·36	245 47	+21·321	...	...
·82	5 29 17	6·25	4·36	,,	2911·94	245 45	,,	4931·48	61 7
·83	5 43 44	6·60	4·50	,,	2920·49	245 43	,,	4922·82	61 8
·84	5 58 10	6·91	4·65	,,	2929·02	245 41	,,	4914·19	61 9
·85	6 12 36	7·20	4·80	,,	2937·53	245 39	,,	4905·57	61 10
·86	6 27 2	7·46	4·96	,,	2946·03	245 37	,,	4896·97	61 10
·87	6 41 29	−7·70	−5·13	,,	2954·51	245 35	,,	...	...
Oct. 31·50	21 51 10	+7·72	−5·16	+22·329	4365·47	125 28	+20·404	5923·82	301 14
·51	22 5 36	7·49	4·99	,,	4362·64	125 34	,,	5927·27	301 10
·52	22 20 3	7·23	4·83	,,	4359·83	125 41	,,	5930·75	301 5
·53	22 34 29	6·94	4·68	,,	4357·05	125 47	,,	5934·26	301 1
·54	22 48 55	+6·63	−4·53	,,	4354·29	125 53	,,	..	...
Oct. 31·53	22 34 29	+6·94	−4·68	+22·347	3486·42	243 34	+21·321	...	...
·54	22 48 55	6·63	4·53	,,	3494·89	243 33	,,	4343·69	62 17
·55	23 3 22	6·29	4·39	,,	3503·39	243 32	,,	4335·17	62 17
·56	23 17 48	5·93	4·25	,,	3511·92	243 31	,,	4326·63	62 18
·57	23 32 14	5·54	4·13	,,	3520·46	243 29	,,	4318·08	62 19
·58	23 46 40	+5·13	−4·01	,,	3529·03	243 28	,,	...	...

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1888	h m s	″	″	°	″	° ′	°	″	° ′
Oct. 31·84	6 2 6	−7·01	−4·71	+21·321	4083·39	62 46	+22·347	...	...
·85	6 16 32	7·29	4·87	,,	4074·79	62 47	,,	3763·60	242 55
·86	6 30 59	7·54	5·03	,,	4066·22	62 49	,,	3772·18	242 53
·87	6 45 25	−7·76	−5·14	,,	4057·67	62 50	,,	3780·73	242 52
Nov. 1·51	22 9 33	+7·40	−4·95	+22·329	4192·44	136 36	+20·388	3445·83	340 5
·52	22 23 59	7·13	4·79	,,	4191·33	136 43	,,	3443·54	339 57
·53	22 38 25	6·84	4·64	,,	4190·21	136 50	,,	3441·28	339 48
·54	22 52 22	6·52	4·50	,,	4189·09	136 57	,,	3439·03	339 40
·55	23 7 18	+6·17	−4·36	,,	4187·97	137 4	,,	3436·81	339 31
Nov. 1·55	23 7 18	+6·17	−4·36	+22·347	4334·74	241 28	+21·321	3507·17	64 33
·56	23 21 44	5·80	4·23	,,	4343·37	241 27	,,	3498·64	64 35
·57	23 36 11	5·40	4·11	,,	4352·00	241 27	,,	3490·12	64 36
·58	23 50 37	+4·98	−3·99	,,	4360·63	241 26	,,	...	...
Nov. 1·81	5 22 44	−6·12	−4·35	+21·321	3282·75	65 16	+22·347	...	...
·82	5 37 10	6·47	4·48	,,	3274·17	65 18	,,	4570·39	241 5
·83	5 51 37	6·79	4·63	,,	3265·62	65 20	,,	4579·08	241 4
·84	6 6 3	7·09	4·78	,,	3257·09	65 23	,,	4587·74	241 4
·85	6 20 29	7·36	4·94	,,	3248·58	65 25	,,	4596·38	241 3
·86	6 34 55	7·60	5·10	,,	3240·09	65 27	,,	4605·00	241 2
·87	6 49 22	−7·82	−5·27	,,	3231·63	65 29	,,	...	...
Nov. 2·49	21 44 36	+7·77	−5·24	+22·329	4195·07	147 53	+20·388	3289·18	326 11
·50	21 59 3	7·56	5·07	,,	4195·74	148 0	,,	3288·82	326 2
·51	22 13 29	7·31	4·91	,,	4196·40	148 7	,,	3288·50	325 54
·52	22 27 56	7·03	4·76	,,	4197·07	148 14	,,	3288·21	325 45
·53	22 42 22	+6·73	−4·61	,,	4197·75	148 21	,,	3287·96	325 36
Nov. 3·49	21 48 33	+7·69	−5·19	+21·317	3424·55	131 3	+20·388	3331·55	311 32
·50	22 2 59	7·46	5·03	,,	3422·82	131 11	,,	3333·26	311 23
·51	22 17 26	7·21	4·87	,,	3421·09	131 19	,,	3335·02	311 15
·52	22 31 52	6·92	4·72	,,	3419·37	131 27	,,	3336·81	311 6
·53	22 46 18	+6·61	−4·58	,,	3417·67	131 36	,,	3338·64	310 57
Nov. 3·53	22 46 18	+6·61	−4·58	+22·347	5989·23	238 49	+21·321	...	...
·54	23 0 45	6·27	4·44	,,	5997·79	238 49	,,	1905·35	75 43
·55	23 15 11	5·91	4·31	,,	6006·37	238 48	,,	1898·39	75 49
·56	23 29 37	+5·52	−4·18	,,	6014·97	238 47	,,	1890·42	75 55
Nov. 3·82	5 45 3	−6·50	−4·54	+21·321	1683·17	78 58	+22·347	6241·95	238 34
·83	5 59 30	6·82	4·68	,,	1675·43	79 6	,,	6250·64	238 33
·84	6 13 56	7·12	4·83	,,	1667·71	79 14	,,	6259·34	238 33
·85	6 28 22	−7·39	−4·99	,,	1660·01	79 22	,,	6268·05	238 33

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1888	h m s	″	″	°	″	° ′	°	″	° ′
Nov. 7·48	21 49 53	+7·55	−5·18	+21·304	4882·73	150 55	+19·340	5551·53	356 31
·49	22 4 19	7·32	5·02	,,	4884·31	151 1	,,	5546·62	356 26
·50	22 18 46	7·06	4·87	,,	4885·89	151 7	,,	5541·72	356 22
·51	22 33 12	6·77	4·72	,,	4887·47	151 12	,,	5536·83	356 18
·52	22 47 38	+6·45	−4·58	,,	4889·06	151 18	,,	5531·94	356 14
Nov. 7·52	22 47 38	+6·45	−4·58	+20·388	5074·46	270 28	+20·341	...	...
·53	23 2 5	6·11	4·45	,,	5080·90	270 24	,,	5349·73	87 29
·54	23 16 32	5·74	4·33	,,	5087·36	270 20	,,	5343·05	87 32
·55	23 30 57	5·35	4·21	,,	5093·84	270 16	,,	5336·36	87 36
·56	23 45 24	4·94	4·10	,,	5100·36	270 13	,,	5329·66	87 39
·57	23 59 50	4·51	4·01	,,	5106·89	270 9	,,	...	...
·58	24 14 16	4·06	3·91	,,	5113·45	270 6	,,	...	...
·59	24 28 43	+3·60	−3·83	,,	5120·02	270 2	,,	...	...
Nov. 10·76	4 46 1	−5·19	−4·22	+20·341	3773·28	114 5	+19·340	...	...
·77	5 0 27	5·58	4·33	,,	3770·16	114 12	,,	4383·24	328 26
·78	5 14 54	5·95	4·45	,,	3767·08	114 19	,,	4381·59	328 20
·79	5 29 20	−6·29	−4·58	,,	3764·04	114 26	,,	4379·92	328 13
Nov. 11·46	21 36 46	+7·60	−5·30	+20·341	3625·48	122 6	+19·340	4284·21	321 31
·47	21 51 11	7·39	5·14	,,	3623·54	122 13	,,	4283·57	321 25
·48	22 5 39	7·16	5·00	,,	3621·60	122 20	,,	4282·95	321 19
·49	22 20 5	6·89	4·85	,,	3619·67	122 27	,,	4282·36	321 12
·50	22 34 32	+6·59	−4·71	,,	3617·74	122 35	,,	4281·79	321 6
Nov. 11·75	4 35 31	−4·90	−4·16	+20·341	3573·81	125 41	+19·340	4272·37	318 24
·76	4 49 57	5·30	4·27	,,	3572·41	125 49	,,	4272·05	318 18
·77	5 4 24	−5·68	−4·38	,,	3571·05	125 57	,,	4271·71	318 12
Nov. 12·51	22 52 55	+6·14	−4·54	+20·341	3544·55	134 56	+19·340	4262·12	310 40
·52	23 7 21	5·79	4·42	,,	3544·41	135 4	,,	4262·88	310 33
·53	23 21 47	5·42	4·31	,,	3544·29	135 11	,,	4263·67	310 27
·54	23 36 14	5·02	4·20	,,	3544·18	135 18	,,	4264·49	310 21
·55	23 50 40	4·60	4·10	,,	3544·08	135 26	,,	4265·32	310 15
·56	24 5 6	4·17	4·01	,,	3543·98	135 33	,,	4266·17	310 8
·57	24 19 33	3·72	3·93	,,	3543·90	135 41	,,	4267·04	310 2
·58	24 33 59	+3·25	−3·86	,,	3543·83	135 49	,,	4267·93	309 56
Nov. 12·76	4 53 54	− 5·40	−4·31	+20·341	3537·04	138 6	+19·340	4285·30	308 2
·77	5 8 20	5·78	4·42	,,	3547·53	138 14	,,	4286·25	307 55
·78	5 22 47	− 6·13	−4·54	,,	3548·02	138 21	,,	4287·18	307 49
Nov. 13·46	21 44 40	+7·41	−5·19	+20·341	3639·13	146 13	+19·340	4353·81	301 12
·47	21 59 6	7·19	5·05	,,	3640·65	146 20	,,	4355·58	301 6
·48	22 13 32	6·93	4·90	,,	3642·17	146 27	,,	4357·39	301 0
·49	22 27 58	+6·65	−4·77	,,	3643·70	146 34	,,	4359·23	300 55

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		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′	°	″	° ′
Nov. 13·49	22 27 58	+6·65·	−4·77	+19·340	4359·23	300 55	+19·324	...	...
·50	22 42 25	6·34·	4·63·	,,	4361·10·	300 50	,,	6268·22·	91 47
·51	22 56 51	6·01	4·51	,,	4362·99·	300 44	,,	6263·06·	91 50
·52	23 11 18	5·65·	4·39·	,,	4364·91	300 38	,,	6257·89·	91 53
·53	23 25 44	+5·27·	−4·28·	,,	4366·85·	300 32	,,	6252·71	91 56
Nov. 13·77	5 12 17	−5·87	−4·46·	+19·324	6128·65·	93 12	+19·340	...	...
·78	5 26 43	6·21	4·59	,,	6123·70	93 15	,,	4419·45	298 5
·79	5 41 10	6·52·	4·71·	,,	6118·78	93 19	,,	4421·50·	298 0
·80	5 55 36	6·82	4·85·	,,	6113·89	93 22	,,	4423·54·	297 54
·81	6 10 2	7·08·	4·99·	,,	6109·03·	93 25	,,	4425·57·	297 49
·82	6 24 29	7·32	5·14	,,	6104·21·	93 28	,,	4427·59·	297 43
·83	6 38 55	−7·53	−5·29	,,	6099·43	93 32	,,	4429·59	297 37
Nov. 14·45	21 34 10	+7·52	−5·29·	+20·341	3882·30·	156 42	+18·283	2837·40	347 27
·46	21 48 36	7·32	5·15	,,	3885·19·	156 48	,,	2833·33·	347 20
·47	22 3 2	7·08	5·00	,,	3888·09·	156 54	,,	2829·28	347 12
·48	22 17 29	6·82	4·86·	,,	3891·00	157 0	,,	2825·24	347 4
·49	22 31 55	+6·53	−4·73	,,	3893·91·	157 6	,,	2821·21·	346 57
Nov. 14·49	22 31 55	+6·53	−4·73	+19·324	5826·15·	97 15	+19·340	...	...
·50	22 46 21	6·21·	4·60	,,	5821·77·	97 19	,,	4565·93	291 42
·51	23 0 48	5·87·	4·47·	,,	5817·38·	97 22	,,	4568·76	291 37
·52	23 15 14	5·51·	4·36	,,	5812·98	97 26	,,	4571·62·	291 32
·53	23 29 40	+5·13	−4·25·	,,	5808·56	97 29	,,	4574·52	291 26
Nov. 16·77	5 24 6	−6·10	−4·58	+19·340	5315·18	274 59	+19·324	5127·00·	112 34
·78	5 38 33	6·41	4·69·	,,	5319·30·	274 55	,,	5124·90·	112 39
·79	5 52 59	6·70·	4·83·	,,	5323·40	274 52	,,	5122·84	112 43
·80	6 7 26	6·97	4·97	,,	5327·47	274 48	,,	5120·81·	112 48
·81	6 21 52	−7·20·	−5·11	,,	5331·51	274 44	,,	5118·82·	112 52
Nov. 17·44	21 31 33	+7·42·	−5·28·	+19·329	2137·92·	133 6	+18·283	2278·38	300 34
·45	21 45 59	7·23	5·14	,,	2138·34	133 17	,,	2279·47·	300 24
·46	22 0 26	7·00	5·00	,,	2138·75	133 28	,,	2280·61·	300 14
·47	22 14 52	6·74	4·86	,,	2139·15	133 39	,,	2281·79·	300 4
·48	22 29 18	+6·46	−4·73	,,	2139·55	133 50	,,	2283·00·	299 54
Nov. 17·48	22 29 18	+6·46	−4·73	+19·340	5583·72·	270 51	+19·324	...	...
·49	22 43 45	6·15	4·61	,,	5588·14·	270 48	,,	5029·52·	117 52
·50	22 58 11	5·82	4·49	,,	5592·54·	270 45	,,	5027·98·	117 57
·51	23 12 38	5·46	4·37·	,,	5596·92	270 42	,,	5026·48·	118 1
·52	23 27 4	+5·08·	−4·27·	,,	5601·27	270 38	,,	5025·03·	118 6
Nov. 17·76	5 13 37	−5·84	−4·50	+19·324	4993·21·	119 57	+19·340	5709·81	269 22
·77	5 28 3	6·17	4·62	,,	4992·19·	120 2	,,	5714·24·	269 18
·78	5 42 29	6·47·	4·74·	,,	4991·20·	120 7	,,	5718·66	269 15
·79	5 56 56	6·75·	4·87	,,	4990·24·	120 12	,,	5723·05·	269 12
·80	6 11 22	−7·01	−5·01	,,	4989·31	120 16	,,	5727·43	269 9

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1888	h m s	″	″	°	″	° ′ ″	°	″	° ′
Nov. 20·44	21 43 23	+7·13	−5·12	+18·277	336·16·	272 46 9	...	...	...
·45	21 57 49	6·91	4·98·	"	339·50	271 54 0	...	...	...
·46	22 12 15	6·66	4·83·	"	342·92	271 2 50	...	...	...
·47	22 26 42	+6·38	−4·72·	"	346·45	270 12 40	...	...	...
Nov. 20·74	4 56 34	−5·36·	−4·37·	+18·277	466·45·	253 0 39	...	...	...
·75	5 11 0	5·71·	4·48	"	471·41	252 31 58	...	...	...
·76	5 25 26	6·04·	4·59·	"	476·37	252 3 46	...	...	...
·77	5 39 53	6·34·	4·71·	"	481·34	251 36 4	...	...	...
·78	5 54 19	−6·62·	−4·84	"	486·32	251 8 51	...	...	...
Nov. 21·44	21 47 19	+7·03	−5·06·	+18·277	818·69·	233 4 7	...	...	...
·45	22 1 45	6·80	4·93·	"	824·25·	232 55 55	...	...	...
·46	22 16 12	+6·54	−4·80·	"	829·83·	232 47 54	...	...	...
Nov. 21·74	5 0 30	−5·44	−4·40	+18·277	992·17·	229 40 7	...	...	...
·75	5 14 56	5·78	4·50·	"	997·98·	229 33 56	...	...	...
·76	5 29 23	6·10	4·62·	"	1003·79	229 27 46	...	...	...
·77	5 43 50	−6·39·	−4·74	"	1009·58·	229 21 38	...	...	...
Nov. 22·43	21 36 50	+7·13	−5·15	+18·277	1364·42·	223 39 37	...	...	...
·44	21 51 16	6·92	5·01·	"	1369·96·	223 36 39	...	...	...
·45	22 5 42	6·67·	4·88·	"	1375·52	223 33 44	...	...	...
·46	22 20 9	+6·42	−4·75·	"	1381·08·	223 30 52	...	...	...
Nov. 22·73	4 50 0	−5·16	−4·32·	+18·277	1535·95	222 22 41	...	...	...
·74	5 4 27	5·51	4·41·	"	1541·70	222 20 5	...	...	...
·75	5 18 53	5·84	4·53·	"	1547·43·	222 17 27	...	...	...
·76	5 33 20	6·15·	4·65	"	1553·16	222 14 47	...	...	...
·77	5 47 46	−6·43·	−4·77	"	1558·87·	222 12 6	...	...	...
Nov. 23·47	22 38 31	+6·00·	−4·59·	+19·324	5949·91·	155 18	+16·247	...	358 14
·48	22 52 58	5·68·	4·48·	"	5953·08·	155 20	"	6684·21·	358 13
·49	23 7 24	5·35	4·38	"	5956·26	155 23	"	6679·54·	358 12
·50	23 21 51	+4·99	−4·28·	"	5959·44	155 26	"	6674·87	358 10
Nov. 30·45	22 37 15	+5·74	−4·50·	+17·315	705·09·	16 18 6	...	...	...
·46	22 51 41	5·43·	4·40	"	701·09·	16 20 47	...	...	...
·47	23 6 7	5·11	4·30·	"	697·08·	16 23 26	...	...	...
·48	23 20 34	4·77	4·21·	"	693·07	16 26 3	...	...	...
·49	23 35 0	4·40·	4·13·	"	689·05	16 28 37	...	...	...
·50	23 49 26	4·02·	4·05·	"	685·02	16 31 9	...	...	...
·51	24 3 53	+3·62·	−3·98·	"	680·98	16 33 40	...	...	...
Dec. 1·43	22 12 19	+6·16·	−4·67·	+17·315	336·05	33 5 12	...	...	...
·44	22 26 45	5·90·	4·56·	"	332·69	33 24 52	...	...	...
·45	22 41 11	5·62	4·46	"	329·33	33 44 49	...	...	...
·46	22 55 38	5·31	4·36	"	325·96·	34 5 2	...	...	...
·47	23 10 4	+4·98·	−4·26·	"	322·60	34 25 32	...	...	...

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Date, Greenwich Mean Time.	N.H. Sidereal Time.	Parallax. In R.A.	Parallax. In Dec.	Comparison Star.	Computed Distance.	Computed Position-Angle.	Comparison Star.	Computed Distance.	Computed Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Dec. 1·74	5 39 56	−5·94	−4·57	+17·315	235·60	47 28 16	...	...	...
·75	5 54 22	6·19	4·68	„	232·78	48 10 49	...	...	...
·76	6 8 49	6·42	4·80	„	230·03	48 54 44	...	...	...
·77	6 23 15	6·63	4·92	„	227·33	49 40 1	...	...	...
·78	6 37 41	6·81	5·04	„	224·69	50 26 41	...	...	...
·79	6 52 8	6·96	5·16	„	222·12	51 14 45	...	...	...
·80	7 6 34	−7·08	−5·29	„	219·61	52 4 12	...	...	...
Dec. 2·43	22 16 16	+6·05	−4·62	+17·315	227·64	118 31 44	...	...	...
·44	22 30 42	5·78	4·51	„	229·51	119 20 18	...	...	...
·45	22 45 8	5·50	4·41	„	231·41	120 8 11	...	...	...
·46	22 59 35	+5·19	−4·32	„	233·34	120 55 34	...	...	...
Dec. 2·73	5 29 26	−5·69	−4·48	+17·315	299·68	138 6 46	...	...	...
·74	5 43 52	5·96	4·58	„	302·71	138 34 54	...	...	...
·75	5 58 18	6·21	4·69	„	305·78	139 2 17	...	...	...
·76	6 12 45	6·43	4·81	„	308·88	139 28 58	...	...	...
·77	6 27 11	−6·63	−4·92	„	312·03	139 54 50	...	...	...
Dec. 4·42	22 9 42	+6·07	−4·62	+17·315	907·61	158 42 50	...	...	...
·43	22 24 8	5·82	4·52	„	911·10	158 44 59	...	...	...
·44	22 38 34	5·55	4·42	„	914·59	158 47 12	...	...	...
·45	22 53 1	+5·25	−4·32	„	918·07	158 49 28	...	...	...
Dec. 6·41	22 3 9	+6·09	−4·63	+16·247	1562·71	329 6 53	...	...	...
·42	22 17 35	5·86	4·52	„	1559·27	329 5 54	...	...	...
·43	22 32 1	5·60	4·42	„	1555·83	329 4 53	...	...	...
·44	22 46 28	+5·32	−4·33	„	1552·39	329 3 50	...	...	...
Dec. 6·71	5 16 22	−5·25	−4·30	+16·247	1458·84	328 27 35	...	...	...
·72	5 30 48	5·54	4·40	„	1455·24	328 26 21	...	...	...
·73	5 45 12	5·80	4·50	„	1451·62	328 25 10	...	...	...
·74	5 59 39	−6·04	−4·60	„	1447·99	328 24 2	...	...	...
Dec. 12·45	23 24 33	+4·31	−3·98	+16·247	848·86	116 57 41	...	...	...
·46	23 39 0	3·98	3·90	„	852·79	117 0 13	...	...	...
·47	23 53 26	3·63	3·84	„	856·72	117 2 50	...	...	...
·48	24 7 52	+3·27	−3·79	„	860·65	117 5 33	...	...	...
Dec. 12·70	5 25 32	−5·15	−4·20	+16·247	947·94	118 0 47	...	...	...
·71	5 39 58	5·41	4·29	„	952·07	118 2 59	...	...	...
·72	5 54 25	5·65	4·39	„	956·23	118 5 7	...	...	...
·73	6 8 51	−5·86	−4·49	„	960·41	118 7 11	...	...	...

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Date, Greenwich Mean Time.	N.H. Sidereal Time.	Parallax.		Comparison Star.	Computed		Comparison Star.	Computed	
		In R.A.	In Dec.		Distance.	Position-Angle.		Distance.	Position-Angle.
1888	h m s	″	″	°	″	° ′ ″	°	″	° ′ ″
Dec. 13·41	22 30 44	+5·36	−4·27	+16·247	1268·17	118 48 33	...	...	...
·42	22 45 11	5·09	4·18	"	1272·37	118 49 6	...	...	...
·43	22 59 37	4·81	4·09	"	1276·55	118 49 38	...	...	...
·44	23 14 13	+4·51	−4·01	"	1280·72	118 50 11	...	...	...
Dec. 13·69	5 15 3	−4·91	−4·11	+16·247	1385·09	119 8 10	...	...	...
·70	5 29 29	5·18	4·20	"	1389·42	119 8 48	...	...	...
·71	5 43 55	5·43	4·29	"	1393·77	119 9 24	...	...	...
·72	5 58 22	5·66	4·38	"	1398·14	119 9 59	...	...	...
·73	6 12 48	5·87	4·48	"	1402·54	119 10 32	...	...	...
·74	6 27 14	6·05	4·59	"	1406·96	119 11 3	...	...	...
·75	6 41 41	−6·21	−4·69	"	1411·40	119 11 33	...	...	...

7.—The Heliometer Measures of Iris and Comparison Stars.

These measures and their reduction, as far as the finding of the instrumental data, are given in complete detail in Vol. II. The principal correction to be applied is that for refraction ; this has been computed by the formulæ of Bessel, viz. :—

Refraction in distance $\sigma - s = s\,\kappa\,\text{tg.}^2\,\zeta\,\cos^2(p-q) + s\,k$

Refraction in pos.-angle $\pi - p = -\kappa'\,\text{tg.}^2\,\zeta\,\cos(p-q)\sin(p-q) - k'\,\text{tg.}\,\zeta\,\sin q\,\text{tg.}\,\delta_0$

σ and s being the true and apparent distance, π and p the true and apparent position-angle, ζ and q the true zenith distance and parallactic angle, and δ_0 the mean declination of the pair of stars. The constants κ, k, κ', and k' were found from the following table, which gives their logarithms with the argument log. tg.$^2\,\zeta$.

Log. tg.$^2\,\zeta$	κ	k	κ'	k'
8·0	6·4458	6·4471	1·7602	1·7614
9·0	6·4457	6·4471	1·7601	1·7614
0·0	6·4441	6·4466	1·7585	1·7608
0·1	6·4436	6·4465	1·7580	1·7606
0·2	6·4430	6·4463	1·7574	1·7604
0·3	6·4423	6·4461	1·7567	1·7601
0·4	6·4413	6·4458	1·7557	1·7598
0·5	6·4401	6·4454	1·7545	1·7594
0·6	6·4387	6·4450	1·7531	1·7589
0·7	6·4370	6·4445	1·7514	1·7582
0·8	6·4347	6·4439	1·7491	1·7574
0·9	6·4319	6·4431	1·7463	1·7564
1·0	6·4281	6·4421	1·7425	1·7552

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In practice, the logarithms taken from the above table were diminished by 0·0300, and the resulting refractions multiplied by a "meteorological factor," derived on the assumption that Bessel's A″ and λ″ could be put equal to unity. This factor was tabulated, and the following table shows its amount for Fahrenheit degrees and millimetres of barometer :—

—	750mm.	760mm.	770mm.
20° Fahr.	1·135	1·150	1·165
30	1·110	1·126	1·140
40	1·086	1·102	1·116
50	1·064	1·080	1·093
60	1·043	1·058	1·071
70	1·022	1·037	1·050

The special reductions which have been applied for each observatory are summarised in the subsequent notes.

Cape Distances.—The distance measures as communicated by Dr. Gill were expressed in seconds of arc, corrected for division errors and run as described in the Victoria discussion, and need only the application of the refraction correction.

Cape Position-Angles.—According to a communication of Prof. Jacoby, the observed position-angles with the Cape heliometer require the corrections—

$$(+\xi \sin\tau - \eta\cos\tau)\sec\delta + i_1 \sec\delta - c\,\mathrm{tg.}\,\delta - e\cos\phi\,\mathrm{tg.}\,\delta\sin\tau - \mu(\sin\phi\cos\delta - \cos\phi\sin\delta\cos\tau). \quad \text{Tel. East.}$$

$$(+\xi \sin\tau - \eta\cos\tau)\sec\delta - i_1 \sec\delta + c\,\mathrm{tg.}\,\delta - e\cos\phi\,\mathrm{tg.}\,\delta\sin\tau + \mu(\sin\phi\cos\delta - \cos\phi\sin\delta\cos\tau). \quad \text{Tel. West.}$$

where

ξ	= + 28·1		Derived from readings of the Declination circle alone.
η	+ 25·9		" " " "
e	+ 4·4		" " " "
ϵ	− 59·6		" circumpolar pairs.
i	+ 7·8		" readings of the hour circle alone.
c	− 6·5		" " " "
i_1	− 25·5	=	$i - \epsilon \sin\phi$.
μ	+ 21·0		Derived from observations of the standard stars.

Using these values for the measures of the standard stars, and the assumed positions of these latter as on p. 27, an approximate value for the index error of the position-circle was found to be − 35′ 48″. The combination of all these results leads to the following table of corrections for the position of the instrument "Tel. East," in which all the observations of the Iris series were made.

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H. A.	Dec. + 16°	Dec. + 24°	H. A.	Dec. + 16°	Dec. + 24°
h m	′ ″	′ ″	h m	′ ″	′ ″
+ 0 0	− 36 23	− 36 23	+ 2 0	− 36 5	− 36 4
20	36 21	36 20	20	36 2	36 1
40	36 18	36 17	40	35 59	35 57
+ 1 0	36 15	36 14	+ 3 0	35 55	35 54
20	36 12	36 11	20	− 35 52	− 35 51
40	− 36 8	− 36 8			

Leipzig Distances.—The Leipzig distance measures as forwarded by Dr. Peter were expressed in scale divisions, and have been converted into arc, after adding the refraction corrections, with the value—

$$R = 21''\cdot725.$$

derived from the measures of the standard stars. No further corrections have been applied.

Leipzig Position-Angles.—From the observations for the position of the instrument communicated by Dr. Peter, I have derived the following values, in the same notation as used for the Cape data :—

	″	″	″	″	″
1888, September 28	$\xi = +$ 86·0	$\eta = +$ 8·8	$c = +$ 45·9	$i_1 = -$ 58·6	$e = +$ 7
November 13	+ 89·5	+ 6·0	46·8	69·1	+ 18
December 13	+ 91·5	+ 6·5	45·9	71·2	+ 18
Means	+ 89	+ 7	+ 46	− 66	+ 14

The observations of the standards on September 27, October 1 and October 4, when corrected by these values of ξ, η, &c., lead to a value of μ of 28″, and using these results an approximate mean index error for the period October 24 to December 13 was found to be + 59′ 12″. For the three days previous to the Iris series proper, September 27, October 1 and October 4, the index error appears to have been different, about 1° 0′ 37″. With these data the following tables were computed, and used for all measures from October 24 on :—

H. A.	Dec. + 15°.	Dec. + 20°.	Dec. + 15°.	Dec. + 20°.
h m	° ″	° ″	° ″	° ″
− 6 0	+ 1 − 244	+ 1 − 253	+ 1 − 40	+ 1 − 39
5 30	− 243	− 252	− 40	− 39
5 0	− 242	− 251	− 40	− 39
4 30	− 239	− 248	− 38	− 37
4 0	− 234	− 242	− 34	− 32
3 30	− 227	− 234	− 28	− 26
− 3 0	− 219	− 225	− 21	− 19
	Tel. West (A. *f.*)		Tel. East (A. *r.*)	

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Oxford Distances.—The distance measures with the Oxford heliometer have been reduced by taking the means of the scale and micrometer readings as given by Mr. Stone, and forming the differences for the two scales. No run correction has been deduced as this seemed to be very small, and the proper mode of applying it a little doubtful. The distances thus found were converted into arc with the value

$$R = 29''\cdot43.$$

Oxford Position-Angles.—From the measures of the position-angles of the standard stars on November 20, December 6 and December 9, approximate values of the index error were found to be—

Tel. East, 62° 49′ 0″ Tel. West, 62° 19′ 30″.

These and the refraction corrections have been applied to the means of the circle readings.

Yale Distances.—No further corrections have been deemed necessary to the means given for the Yale distance measures in Vol. II. The run was, as is shown there, practically zero. The systematic division errors are insignificant, less than 0″·005, for all distances up to 1800″. For the larger distances the systematic division errors will be practically eliminated, along with the scale-value, from the results of two opposite and nearly equal distances. The conversion into arc has been made with the values—

$\log R = 1\cdot1031740$ Elkin. $\log R = 1\cdot1030884$ Hall.

Yale Position-Angles.—The instrumental constants for the Yale heliometer were taken as follows, using the same notation as for the Cape results :—

$$\xi = +71'' \qquad \eta = -52'' \qquad \epsilon = 0''$$
$$c = -37 \qquad i_1 = -16 \qquad \mu = 85$$

and the index error taken $= -80''$, from a comparison with the standard star measures. These values were tabulated as follows :—

H. A.	Dec. + 15°	Dec. + 25°	H. A.	Dec. + 15°	Dec. + 25°
h m	″	″	h m	″	″
− 5 0	− 181	− 184	+ 2 0	+ 36	+ 34
4 30	168	168	2 30	41	41
4 0	155	154	3 0	45	46
3 30	142	139	3 30	48	49
3 0	128	124	4 0		51
2 30	116	111	4 30	49	52
− 2 0	− 103	− 95	+ 5 0	+ 48	+ 53
	Tel. West.			Tel. East.	

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Results of Heliometer Observations of Iris.

No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	″	″	″		° ′ ″	′ ″	″	° ′ ″		
1	Oct. 12	Standards	3 58 36	6514·360	+ 6·807	6521·17	4	...	...		...	...	Im. 2–3, St. 3.
2		+24°·376	4 24 33	769·754	+ 1·075	770·83	4	...	...		...	...	Faint star.
3	Obs. Gill	,,	4 31 20	755·681	+ 1·122	756·80	4	...	...		...	...	Bright star.
4	Oct. 13	Standards	3 54 30	...	...	...	...	136 31 42	—36 7	+ 35	135 56 10	4	Im. 2, St. 2–3.
5		,,	4 22 17·5	6512·953	+ 8·157	6521·11	4	...	...		...	...	,,
6	Obs. Finlay	+24°·376	4 43 41	991·732	+ 0·975	992·71	4	...	...		...	...	,,
7		,,	4 55 27·5	...	...	...	...	193 22 50	—36 0	—130	192 44 40	...	,,
8	Oct. 14	+24°·369	3 38 6	2406·241	+ 2·592	2408·83	4	...	...		...	...	Im. 4, St. 3–4.
9		+22°·375	3 56 17	4481·119	+ 5·152	4486·27	4	...	...		...	...	,,
10	Obs. Gill	,,	4 10 6	4479·834	+ 5·515	4485·35	4	...	...		...	...	,,
11		+24°·369	4 25 5	2404·447	+ 3·485	2407·93	4	...	...		...	...	,,
12		,,	4 34 37	2403·567	+ 3·760	2407·33	4	...	...		...	...	,,
13		+22°·375	4 47 21	4476·125	+ 7·030	4483·15	4	...	...		...	...	,,
14		,,	4 53 41	4475·216	+ 7·402	4482·62	4	...	...		...	...	,,
15		+24°·369	5 4 39	2401·772	+ 4·992	2406·76	4	...	...		...	...	,,
16	Oct. 15	+22°·372	3 39 5	4378·732	+ 4·615	4383·35	4	...	...		...	...	Im. 3–4, St. 3–4.
17		+24°·358	4 40 3·5	5387·846	+ 8·235	5396·08	4	...	...		...	...	,,
18	Obs. Finlay	,,	4 49 15·5	5385·909	+ 9·095	5395·00	4	...	...		...	...	,,
19		+22°·372	5 3 34·5	4366·796	+ 7·440	4374·24	4	...	...		...	...	,,
20	Oct. 21	+23°·226	3 14 11	4159·751	+ 3·857	4163·61	4	...	...		...	...	Im. 1–2, St. 2.
21		+22°·368	3 24 26	3833·136	+ 3·057	3836·19	4	...	...		...	...	,,
22	Obs. Finlay	,,	3 32 12·5	3834·333	+ 3·215	3837·55	4	...	...		...	...	,,
23		+23°·326	3 41 7	4156·880	+ 4·500	4161·38	4	...	...		...	...	,,
24	Obs. Gill	+23°·326	3 52 56	4156·281	+ 4·862	4161·14	4	...	...		...	...	Im. 1–2, St. 2–3.
25		+22°·368	4 4 20·5	3838·858	+ 4·060	3842·92	4	...	...		...	...	,,
26		,,	4 13 39·5	3840·073	+ 4·370	3844·44	4	...	...		...	...	,,
27		+23°·326	4 26 44	4153·440	+ 6·265	4159·70	4	...	...		...	...	,,
28		,,	4 36 47	4152·561	+ 6·847	4159·41	4	...	...		...	...	Im. 2–3, St. 3.
29		+22°·368	4 49 56	3844·300	+ 6·192	3850·49	4	...	...		...	...	,,
30		,,	4 59 50·5	3845·360	+ 6·937	3852·30	4	...	...		...	...	,,
31		+23°·326	5 15 16·5	4147·053	+10·425	4157·48	4	...	...		...	...	,,
32	Oct. 22	Standards	3 8 41	...	...	...	...	136 31 42	—36 14	+ 45	135 56 13	4	Im. 1–2, St. 2.
33		,,	3 22 3	6516·887	+ 5·235	6522·12	4	...	...		...	...	,,
34	Obs. Gill	+22°·354	3 42 29	...	...	...	...	68 36 42	—36 11	+ 3	68 0 34	4	,,
35		,,	3 59 10·5	...	...	...	...	248 41 4	—36 9	+ 18	248 5 13	4	,,
36		Standards	4 18 55·5	...	...	...	...	316 32 14	—36 3	+ 28	315 56 39	4	,,
37		+22°·354	4 35 36	...	...	...	...	248 50 38	—36 2	+ 60	248 15 36	4	,,
38		,,	4 51 40	...	...	...	...	68 53 58	—35 59	+ 87	68 19 26	4	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	″	″	″		° ′ ″	′ ″	″	° ′ ″		
39	Oct. 24	Standards	3 16 31·5	...	...	...	...	136 31 54	—36 13	+ 44	135 56 25	4	Im. 3–4, St. 3–4.
40		,,	3 29 12·5	6516·184	+ 5·385	6521·57	4	...	...		...	...	,,
41	Obs. Gill	+22°·354	3 50 1·5	480·524	+ 0·280	480·80	4	...	...		...	...	,,
42		,,	4 4 48	...	...	...	...	34 1 36	—36 8	— 70	33 24 18	4	,,
43		,,	4 22 54·5	...	...	...	...	214 27 16	—36 4	— 73	213 49 59	4	,,
44		,,	4 38 36·5	506·219	+ 0·260	506·48	4	...	...		...	...	,,
45		,,	4 52 15	...	...	...	...	215 17 38	—36 0	— 77	214 40 21	4	,,
46		,,	5 7 2·5	...	...	...	...	215 39 32	—35 56	— 80	215 2 16	4	,,
47		Standards	5 22 18·5	...	...	...	...	316 32 10	—35 53	— 13	315 56 4	2	,,
48	Oct. 25	+22°·354	3 21 50·5	1222·302	+ 0·542	1222·84	4	...	...		...	...	Im. 1–2, St. 2.
49		+22°·347	3 32 16·5	1604·994	+ 0·900	1605·89	4	...	...		...	...	,,
50	Obs. Finlay	,,	3 39 1·5	1601·545	+ 0·885	1602·43	4	...	...		...	...	,,
51		+22°·354	3 48 48	1237·800	+ 0·487	1238·29	4	...	...		...	...	,,
52		,,	3 58 24	1243·737	+ 0·467	1244·20	4	...	...		...	...	Im. 2–3, St. 2–3.
53		+22°·347	4 9 23·5	1585·228	+ 0·825	1586·05	4	...	...		...	...	,,
54		,,	4 16 21	1581·272	+ 0·812	1582·08	4	...	...		...	...	,,
55		+22°·354	4 28 3·5	1260·382	+ 0·425	1260·81	4	...	...		...	...	,,
56	Oct. 26	Standards	3 18 50	...	...	...	...	136 31 42	—36 13	+ 43	135 56 12	4	Im. 1, St. 1–2.
57		,,	3 29 36·5	6516·063	+ 5·522	6521·58	4	...	...		...	...	,,
58	Obs. Gill	+22°·347	3 50 37·5	899·536	+ 0·740	900·28	4	...	...		...	...	,,
59		,,	3 59 42·5	895·598	+ 0·745	896·34	4	...	...		...	...	,,
60		,,	4 10 44·5	890·459	+ 0·755	891·21	4	...	...		...	...	,,
61		,,	4 20 0	886·444	+ 0·762	887·21	4	...	...		...	...	Im. 2, St. 2.
62		,,	4 31 40·5	...	...	...	...	16 1 20	—36 3	—101	15 23 36	4	,,
63		,,	4 48 38	...	...	...	...	195 35 8	—35 59	—120	194 5 9	4	Im. 1–2, St. 3.
64		Standards	5 4 13·5	...	...	...	...	136 32 10	—35 55	+ 5	135 56 20	...	,,
65		,,	5 13 58·5	6507·212	+14·613	6521·82	3	...	...		...	...	,,
66	Oct. 27	Standards	3 28 12	6515·838	+ 5·430	6521·27	4	...	...		...	...	Im. 2, St. 3.
67		+22°·347	4 2 29	583·119	+ 0·640	583·76	6	...	...		...	...	,,
68	Obs. Finlay	,,	4 49 38	589·846	+ 0·980	590·83	6	...	...		...	...	,,
69	Oct. 29	+22°·331	3 33 8	3895·018	+ 3·310	3898·33	4	...	...		...	...	Im. 1–2, St. 2–3.
70	Obs. Gill	+20°·404	3 51 4	5508·922	+ 5·507	5514·43	4	...	...		...	...	,,
71	Oct. 30	+22°·331	3 25 57	3771·477	+ 3·507	3774·98	3	...	...		...	...	Im. 2–3, St. 2–3.
72		+20°·404	3 35 40·5	5664·642	+ 4·525	5669·17	4	...	...		...	...	,,
73	Obs. Finlay	,,	3 44 44·5	5666·072	+ 4·827	5670·90	4	...	...		...	...	,,
74		+22°·331	3 54 58·5	3769·741	+ 4·245	3773·99	4	...	...		...	...	,,
75		,,	4 4 26	3768·962	+ 4·502	3773·46	4	..	...		...	...	Im. 3 & 3–4, St. 3.
76		+20°·404	4 15 1	5670·570	+ 6·132	5676·70	4	...	...		...	...	,,
77		,,	4 25 46	5671·047	+ 6·805	5677·85	3	...	...		...	...	,,
78		+22°·331	4 38 15·5	3766·422	+ 6·075	3772·50	4	...	...		...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	″	″	″		° ′ ″	′ ″	″	° ′ ″		
79	Oct. 31	+22°·329	3 34 48	4350·085	+ 3·300	4353·38	4	...	...		...	...	Im. 3-4, St. 3-4.
80		+20°·404	3 50 23·5	5933·641	+ 4·607	5938·25	4	...	...		...	...	,,
81	Ob. Gill	,,	4 3 37·5	5936·322	+ 5·140	5941·46	4	...	...		...	...	,,
82		+22°·329	4 18 34·5	4340·028	+ 4·782	4344·81	4	...	...		...	...	,,
83		,,	4 32 0·5	4336·529	+ 5·467	4342·00	4	...	...		...	...	,,
84		+20°·404	5 13 28·5	5949·132	+11·162	5960·29	4	...	...		...	...	,,
85	Nov. 2	+22°·329	3 43 12·5	4172·840	+ 4·477	4177·32	4	...	...		...	...	Im. 1-2, St. 2.
86		+20°·388	3 53 53·5	3302·480	+ 3·542	3306·02	4	...	...		...	...	,,
87	Obs. Gill	,,	4 2 2	3302·008	+ 3·737	3305·74	4	...	...		...	...	,,
88		+22°·329	4 13 47	4173·567	+ 5·532	4179·10	4	...	...		...	...	,,
89		,,	4 22 30·5	4173·674	+ 5·932	4179·61	4	...	...		...	...	,,
90		+20°·388	4 29 49·5	3300·235	+ 4·625	3304·86	4	...	...		...	...	,,
91		,,	4 35 55	3300·420	+ 4·875	3305·29	4	...	...		...	...	,,
92		+22°·329	4 42 26·5	4173·262	+ 7·087	4180·35	4	...	...		...	...	,,
93	Nov. 3	+21°·317	4 6 29·5	3402·643	+ 3·820	3406·46	4	...	...		...	...	Im. —, St. —.
94		+20°·388	4 26 24	3348·316	+ 4·225	3352·54	4	...	...		...	...	(Stars faint.)
95	Obs. Finlay	,,	4 35 29	3349·622	+ 4·627	3354·25	4	...	...		...	...	,,
96		+21°·317	4 56 49·5	3394·166*	+ 6·437	3400·60	4	...	...		...	...	,,
97	Nov. 4	+21°·321	3 45 0·5	...	...	...	...	91 20 46	−36 10	+ 73	90 45 49	4	Im. 3-4, St. 3-4.
98		Standards	4 9 10	...	...	...	...	136 31 48	−36 4	+ 31	135 56 15	4	,,
99	Obs. Gill	+21°·321	4 33 31	...	...	...	...	92 13 18	−36 1	+141	91 39 38	4	,,
100	Nov. 5	Standards	3 30 43·5	6516·445	+ 5·465	6521·91	4	...	...		...	...	Im. 1-2, St. 2-3.
101		+21°·321	3 41 21·5	800·904	+ 0·720	801·62	4	...	...		...	...	,,
102	Obs. Gill	,,	3 46 11	800·357	+ 0·745	801·10	4	...	...		...	...	,,
103		,,	3 54 10	799·507	+ 0·800	800·31	4	...	...		...	...	,,
104		,,	4 1 47	799·236	+ 0·855	800·09	4	...	...		...	...	,,
105		,,	4 8 3·5	798·522	+ 0·895	799·42	4	...	...		...	...	,,
106		,,	4 13 26	798·282	+ 0·935	799·22	4	...	...		...	...	Im. 1-2, St. 3.
107		,,	4 18 24·5	798·015	+ 0·977	798·99	4	...	...		...	...	,,
108		,,	4 23 52·5	797·186	+ 1·030	798·22	4	...	...		...	...	,,
109		,,	4 31 50·5	796·889	+ 1·120	798·01	4	...	...		...	...	,,
110		,,	4 36 55	796·347	+ 1·177	797·52	4	...	...		...	...	,,
111		Standards	4 45 26·5	6511·505	+10·215	6521·72	4	...	...		...	...	,,
112	Nov. 6	+21°·321	3 19 34	1080·195	+ 0·955	1081·15	4	...	...		...	...	Im. 2-3, St. 3.
113		,,	3 28 25	1083·884	+ 0·972	1084·86	4	...	...		...	...	,,
114	Obs. Finlay	,,	3 38 22·5	1087·710	+ 0·992	1088·70	4	...	...		...	...	,,
115		,,	3 47 1	1091·135	+ 1·017	1092·15	4	...	...		...	...	,,
116		Standards	4 39 54·5	6512·472	+ 9·627	6522·10	4	...	...		...	...	,,
117		,,	4 47 22	6511·734	+10·425	6522·16	4	...	...		...	...	,,

* A correction of one revolution of the micrometer is applied.

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	"	"	"		° ′ ″	′ ″ ″	° ′ ″		
118	Nov. 7	+21°·304	3 28 28	4858·035	+ 4·810	4862·84	4	...	...	...	...	Im. 1–2, St. 2.
119		+19°·340	3 37 32	5566·100	+ 5·067	5571·17	4	...	...	...	...	"
120	Obs. Gill	"	3 44 50·5	5563·850	+ 5·175	5569·02	4	...	...	...	...	"
121		+21°·304	3 54 14	4859·810	+ 5·585	4865·39	4	...	...	...	...	"
122		"	4 4 9	4860·577	+ 5·990	4866·57	4	...	...	...	...	Im. 1–2, St. 3.
123		+19°·340	4 11 58·5	5553·308	+ 5·715	5559·02	4	...	...	...	...	"
124		"	4 20 28	5549·891	+ 5·935	5555·83	4	...	...	...	...	"
125		+21°·304	4 31 32·5	4862·489	+ 7·380	4869·87	4	...	...	...	...	"
126		"	4 43 0	4863·522	+ 8·202	4871·72	4	...	...	...	...	Im 2. St. 3.
127		+19°·340	4 52 22	5537·625	+ 7·160	5544·78	4	...	...	...	...	"
128		"	4 59 54	5534·345	+ 7·565	5541·91	4	...	...	...	...	"
129		+21°·304	5 9 7	4863·934	+10·910	4874·84	4	...	...	...	...	"
130	Nov. 9	+21°·304	3 12 26·5	5458·236	+ 5·167	5463·40	4	...	...	...	...	Im. 3, St. 3.
131		+19°·340	3 23 50·5	4724·272	+ 4·325	4728·60	4	...	...	...	...	"
132	Obs. Gill	"	3 44 43·5	4718·693	+ 4·760	4723·45	4	...	...	...	...	"
133		+21°·304	4 6 58	5472·675	+ 6·457	5479·13	4	...	...	...	...	"
134		"	4 15 3·5	5474·346	+ 6·750	5481·10	3	...	...	...	...	"
135	Nov. 10	+20°·341	3 46 54·5	3856·898	+ 2·610	3859·50	4	...	...	...	...	Im. 2–3 to 4, St. 3.
136		+19°·340	3 47 50·5	4446·400	+ 4·832	4451·23	4	...	...	...	...	"
137	Obs. Finlay	"	4 9 36	4443·756	+ 5·217	4448·97	4	...	...	...	...	"
138		+20°·341	4 24 31·5	3846·142	+ 3·802	3849·94	4	...	...	...	...	"
139		"	4 35 21·5	3842·703	+ 4·310	3847·01	4	...	...	...	...	Im. 2–3 to 3, St. 3.
140		+19°·340	4 47 4	4436·439	+ 7·065	4443·50	4	...	...	...	...	"
141		"	4 55 17·5	4434·721	+ 7·670	4442·39	4	...	...	...	...	"
142		+20°·341	5 6 8·5	3832·675	+ 6·527	3839·20	4	...	...	...	...	"
143	Nov. 11	+20°·341	3 46 21	3605·141	+ 2·937	3608·08	4	...	...	...	...	Im. 3 at best, St. 3.
144		+19°·340	3 58 16	4295·702	+ 4·440	4300·14	4	...	...	...	...	"
145	Obs. Gill	"	4 10 52	4294·994	+ 4·877	4299·87	4	...	...	...	...	"
146		+20°·341	4 34 37·5	3597·158	+ 4·582	3601·74	4	...	...	...	...	"
147	Nov. 12	+20°·341	3 37 14·5	3525·106	+ 3·105	3528·21	4	...	...	...	...	Im. 1–2, St. 3.
148		+19°·340	3 46 31	4271·865	+ 3·687	4275·55	4	...	...	...	...	"
149	Obs. Finlay	"	3 54 32·5	4272·050	+ 3·922	4275·97	4	...	...	...	...	"
150		+20°·341	4 4 17·5	3523·787	+ 3·865	3527·65	4	...	...	...	...	"
151		"	4 11 27·5	3523·672	+ 4·115	3527·79	4	...	...	...	...	"
152		+19°·340	4 19 42·5	4272·105	+ 4·862	4276·97	4	...	...	...	...	"
153		"	4 26 49·5	4272·125	+ 5·200	4277·32	4	...	...	...	...	"
154		+20°·341	4 36 59·5	3522·286	+ 5·262	3527·55	4	...	...	...	...	"
155		"	4 47 50·5	3521·739	+ 5·932	3527·67	4	...	...	...	...	"
156		+19°·340	4 58 11	4271·788	+ 7·320	4279·11	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	″	″	″		° ′ ″	′ ″ ″	° ′ ″		
157	Nov. 13	+20°·341	3 29 28·5	3615·325	+ 3·350	3618·67	4	...	...	...	..	Im. 2–3, St. 3.
158		+19°·340	3 43 38·5	4366·217	+ 3·210	4369·43	4	...	...	...	...	,,
159	Obs. Gill	,,	3 51 18·5	4366·885	+ 3·415	4370·30	4	...	...	...	...	,,
160		+20°·341	4 1 42·5	3618·605	+ 4·130	3622·73	4	...	...	...	...	,,
161		,,	4 10 24·5	3619·661	+ 4·410	3624·07	4	...	...	...	...	Im. 2, St. 2–3.
162		+19°·340	4 25 9	4370·142	+ 4·670	4374·81	4	...	...	...	...	,,
163		,,	4 37 1	4371·062	+ 5·260	4376·32	4	...	...	...	...	,,
164		+20°·341	4 48 4	3621·917	+ 6·217	3628·13	4	...	...	...	...	,,
165	Nov. 18	Standards	2 1 34·5	6518·158	+ 3·512	6521·67	4	...	...	...	...	Im. 3 & 3–4, St. 3
166		+18°·277	2 33 52	1160·409	+ 0·497	1160·91	4	...	...	...	...	Im. 2, St. 3.
167	Obs. Finlay	,,	3 8 13	1145·392	+ 0·440	1145·83	4	...	...	...	...	,,
168		,,	4 17 47	...	...	...	...	199 35 26	−36 3 − 15	198 59 8	4	,,
169		Standards	4 56 23·5	...	...	...	...	136 31 50	−35 57 + 10	135 56 3	4	,,
170		+18°·277	5 18 13	...	...	...	...	199 4 8	−35 53 + 44	198 28 59	4	,,
171	Nov. 19	+18°·277	4 1 25·5	538·343	+ 0·495	538·84	4	...	...	...	...	Im. 2–3, St. 2–3.
172		,,	4 9 13	535·947	+ 0·503	536·45	4	...	...	...	...	,,
173	Obs. Gill	,,	4 21 3·5	531·299	+ 0·530	531·83	4	...	...	...	...	,,
174		,,	4 33 30·5	526·795	+ 0·545	527·34	4	...	...	...	...	,,
175		Standards	4 45 18·5	6511·515	+10·242	6521·76	4	...	...	...	...	,,
176		+18°·277	4 57 8·5	...	...	...	...	178 24 53	−35 56 −179	177 45 58	4	Im. 3, St. 3&3–4.
177		Standards	5 9 33	...	...	...	...	136 32 6	−35 55 + 0	135 56 11	4	,,
178		+18°·277	5 24 2	...	...	...	...	357 32 56	−35 52 −273	356 52 31	4	,,
179	Nov. 20	+18°·277	2 26 18	...	...	...	...	100 52 6	−36 21 + 29	100 16 14	4	Im. 2, St. 2–3.
180		,,	2 35 4·5	...	...	...	...	100 11 14	−36 19 + 34	99 35 29	4	,,
181	Obs. Finlay	,,	2 44 6	...	...	...	...	99 40 28	−36 18 + 38	99 4 48	4	,,
182		,,	2 52 30	...	...	...	...	99 6 12	−36 16 + 42	98 30 38	4	,,
183		Standards	3 3 6	...	...	...	...	136 31 42	−36 6 + 46	135 56 22	4	,,
184		+18°·277	3 19 40·5	...	...	...	...	277 18 40	−36 12 + 57	276 43 25	4	,,
185		,,	3 28 4·5	...	...	...	...	276 45 32	−36 11 + 63	276 10 24	4	,,
186		,,	3 37 34·5	...	...	...	...	276 6 4	−36 10 + 71	275 31 5	4	,,
187		,,	3 45 20·5	...	...	...	...	275 36 28	−36 8 + 77	275 1 37	4	,,
188		Standards	4 6 20·5	6514·956	+ 7·095	6522·05	4	...	...	...	...	Im. 2–3 & 3, St. 3 & 3–4.
189		+18°·277	4 16 11·5	353·531	+ 0·205	353·74	4	...	...	...	...	,,
190		,,	4 23 21·5	355·178	+ 0·217	355·39	4	...	...	...	...	,,
191		,,	4 34 50	358·060	+ 0·240	358·30	4	...	...	...	...	,,
192		,,	4 42 5·5	359·848	+ 0·267	360·11	4	...	...	...	...	,,
193		,,	4 49 37·5	361·765	+ 0·290	362·05	4	...	...	...	...	,,
194		,,	4 54 37	362·828	+ 0·315	363·14	4	...	...	...	...	,,
195		Standards	5 6 44	6509·410	+13·235	6522·64	4	...	...	...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	′ ″	″	° ′ ″		
197	Nov. 22	+18°·277	0 4 31·5	1273·199	+ 1·320	1274·52	4	...	...		...	...	Im. 2, St. 3.
198		"	0 12 33·5	1276·273	+ 1·242	1277·51	4	...	...		...	...	"
199	Obs. Finlay	"	0 21 23	1279·869	+ 1·175	1281·04	4	...	...		...	...	"
200		"	0 29 33	1283·531	+ 1·112	1284·64	4	...	...		...	...	"
201		Standards	0 42 51·5	6518·947	+ 2·570	6521·52	4	...	...		...	...	"
202		+18°·277	3 32 57·5	...	...	...	...	45 0 56	−36 10	− 38	44 24 8	4	"
203		"	3 50 12·5	...	...	...	...	44 57 16	−36 7	− 35	44 20 34	4	Im. 3, St. 3–4.
204		Standards	4 17 26·5	...	...	...	...	136 31 56	−36 3	+ 29	135 56 22	4	Im. 3–4, St. 3.
205	Nov. 23	+19°·324	3 53 53·5	5916·334	+ 6·372	5922·71	4	...	...		...	...	Im. 2, St. 2–3.
206		+16°·247	4 3 9·5	6709·007	+ 5·930	6714·94	4	...	...		...	...	"
207	Obs. Gill	"	4 12 16	6705·480	+ 6·147	6711·63	4	...	...		...	...	"
208		+19°·324	4 23 47	5921·459	+ 7·882	5929·34	4	...	...		...	...	"
209	Nov. 24	+19°·324	3 23 27·5	6262·798	+ 5·732	6268·53	4	...	...		...	...	Im. 3, St. 3.
210		+16°·247	3 40 14·5	6248·943	+ 5·195	6254·14	4	...	...		...	...	"
211	Obs. Finlay	"	3 50 4	6245·618	+ 5·362	6250·98	4	...	...		...	...	"
212		+19°·324	4 8 5	6272·521	+ 7·292	6279·81	4	...	...		...	...	Im. 3–4, St. 3–4 & 4.
213	Nov. 28	Standards	3 24 37·5	...	...	...	...	136 31 34	−36 12	+ 42	135 56 4	4	Im. 2–3 & 3, St. 3.
214		+17°·315	3 43 16·5	...	...	...	...	12 12 48	−36 8	− 53	11 35 47	4	"
215	Obs. Finlay	"	3 58 52	...	...	...	...	12 12 42	−36 6	− 62	11 35 34	4	"
216		"	4 13 22	...	..	...	...	192 12 36	−36 3	− 72	191 35 21	4	"
217		"	4 29 58·5	...	..	...	...	192 11 20	−36 0	− 86	191 33 54	4	Im. 2 & 2–3, St. 3.
218		"	4 44 35	...	...	...	...	192 10 6	−35 59	−101	191 32 26	4	"
219		"	4 55 51	...	...	...	...	192 9 48	−35 57	−117	191 31 54	4	"
220		Standards	5 11 56·5	...	...	...	...	136 32 22	−35 55	− 2	135 56 25	4	Im. 2–3, St. 3–4.
221	Nov. 29	+17°·315	2 49 23·5	1161·640	+ 0·780	1162·42	4	...	...		...	...	Im. 2–3, St. 3.
222		"	3 1 13·5	1158·036	+ 0·780	1158·82	4	...	...		...	...	"
223	Obs. Gill	Standards	3 3 51·5	6516·884	+ 4·902	6521·79	4	...	...		...	...	Im. 2–3, St. 3–4.
224		+17°·315	3 22 14	1151·599	+ 0·780	1152·38	4	...	...		...	...	Im. 2, St. 2–3.
225		"	3 27 5	1150·020	+ 0·780	1150·80	4	...	...		...	...	"
226		"	3 35 36	...	...	...	...	192 37 56	−36 9	− 49	192 0 58	4	Im. 2, St. 2 & 2–3.
227		"	3 45 8	...	...	...	...	192 37 18	−36 7	− 53	192 0 18	4	"
228		Standards	4 0 31	...	...	...	...	316 31 54	−36 6	+ 34	315 56 22	4	"
229		+17°·315	4 12 2	...	...	...	...	12 36 18	−36 3	− 70	11 59 5	4	"
230		"	4 21 37·5	...	...	...	...	12 38 14	−36 2	− 77	12 0 55	4	"

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No	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	′ ″	″	° ′ ″		
231	Nov. 30	+17°·315	1 48 41·5	763·895	+ 0·535	764·43	4	...	...		...	...	Im. 2–3, St. 2–3.
232		"	2 0 7·5	760·667	+ 0·522	761·19	4	...	...		...	...	"
233	Obs. Finlay	"	2 10 7·5	757·689	+ 0·510	758·20	4	...	...		...	...	"
234		"	2 19 31	755·072	+ 0·502	755·57	4	...	...		...	...	"
235		Standards	2 34 31	6517·725	+ 3·967	6521·69	4	...	...		...	...	"
236		"	3 45 58·5	...	...	...	...	136 31 58	−36 9	+ 37	135 56 26	4	"
237	Dec. 2	+17°·315	2 49 19·5	...	...	...	...	111 13 4	−36 16	+ 50	110 37 38	4	Im. 1–2, St. 2–3.
238		"	2 55 0·5	...	...	...	...	111 38 11	−36 16	+ 52	111 2 47	4	"
239	Obs. Finlay	"	3 2 29	...	...	...	...	112 9 26	−36 15	+ 55	111 34 6	4	"
240		"	3 9 3·5	...	...	...	...	112 35 56	−36 14	+ 59	112 0 41	4	"
241		"	3 16 54·5	...	...	...	...	113 11 26	−36 13	+ 63	112 36 16	4	"
242		"	3 22 8	...	...	...	...	113 31 37	−36 12	+ 66	112 56 31	4	"
243		Standards	3 32 10·5	...	...	...	...	136 31 38	−36 11	+ 40	135 56 7	4	Im. 1–2, St. 3.
244		"	3 47 58·5	6515·912	+ 6·155	6522·07	4	...	...		...	...	Im. 2–3, St. 3–4.
245		+17°·315	3 59 31	209·392	+ 0·157	209·55	4	...	...		...	...	Im. 2–3, St. 3.
246		"	4 8 46	210·897	+ 0·172	211·07	4	...	...		...	...	"
247		"	4 16 22	211·711	+ 0·190	211·90	4	...	...		...	...	"
248		"	4 24 11	212·410	+ 0·207	212·62	4	...	...		...	...	"
249		"	4 35 4·5	214·107	+ 0·240	214·35	4	...	...		...	...	Im. 2, St. 3.
250		"	4 43 9	214·639	+ 0·265	214·90	4	...	...		...	...	Im. 3, St. 3.
251	Dec. 3	+17°·315	3 4 7·5	510·299	+ 0·387	510·68	4	...	...		...	...	Im. 3, St. 3. (by glimpses.)
252		"	3 15 29	512·918	+ 0·405	513·32	4	...	...		...	...	"
253	Obs. Gill	Standards	3 24 57·5	6517·526	+ 5·222	6522·75	4	...	...		...	...	"
254		+17°·315	3 37 51·5	518·366	+ 0·457	518·82	4	...	...		...	...	"
255		"	3 45 31·5	520·241	+ 0·477	520·72	4	...	...		...	...	"
256		"	3 58 18·5	523·432	+ 0·517	523·95	4	...	...		...	...	"
257		"	4 9 55·5	525·829	+ 0·565	526·39	4	...	...		...	...	"
258		"	4 22 3	528·769	+ 0·622	529·39	4	...	...		...	...	"
259	Dec. 4	+17°·315	3 19 28·5	878·176	+ 0·712	878·89	4	...	...		...	...	Im. 3, St. 3.
260		+16°·247	3 35 10·5	2306·891	+ 1·945	2308·84	4	...	...		...	...	Im. 3–4, St. 3.
261	Obs. Finlay	"	3 51 20·5	2303·454	+ 2·127	2305·58	4	...	...		...	...	Im. 3, St. 3.
262		+17°·315	4 56 35·5	901·401	+ 1·377	902·78	4	...	...		...	...	Im. 3, St. 2–3.
263	Dec. 5	+17°·315	3 6 1·5	1241·330	+ 0·952	1242·28	4	...	...		...	...	Im. 2, St. 3.
264		+16°·247	3 18 17·5	1950·798	+ 1·500	1952·30	4	...	...		...	...	"
265	Obs. Gill	"	3 27 33·5	1948·569	+ 1·567	1950·14	4	...	...		...	...	"
266		+17°·315	3 41 15·5	1249·922	+ 1·107	1251·03	4	...	...		...	...	"
267		"	3 49 30·5	1251·904	+ 1·157	1253·06	4	...	...		...	...	Im. 2–3 & 3, St. 2–3.
268		+16°·247	4 4 43	1939·957	+ 1·935	1941·89	4	...	...		...	...	"
269		"	4 18 24	1936·267	+ 2·132	1938·40	4	...	...		...	...	"
270		+17°·315	4 34 33	1262·606	+ 1·550	1264·16	4	...	...		...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	r		° ′ ″	′ ″	″	° ′ ″		
271	Dec. 6	+17°·315	3 0 30·5	1604·649	+ 1·225	1605·87	4	...	...		...	...	Im. 1–2, St. 1–2.
272		+16°·247	3 7 57·5	1591·034	+ 1·175	1592·21	4	...	..		...	...	,,
273	Obs. Finlay	,,	3 15 0	1589·400	+ 1·210	1590·61	4	...	...		...	...	,,
274		+17°·315	3 27 6·5	I	ncomple	te	2	...	...		...	...	Im. faint.
275	Dec. 7	+17°·315	3 16 10	1972·525	+ 1·577	1974·10	4	...	...		...	...	Im. 2, St. 2–3.
276		+16°·247	3 24 12	1220·893	+ 0·962	1221·85	4	...	...		...	...	,,
277	Obs. Gill	,,	3 32 58	1218·477	+ 1·005	1219·48	4	...	...		...	..	,,
278		+17°·315	3 42 9	1978·419	+ 1·767	1980·19	4	...	...		...	...	,,
279		,,	3 51 13·5	1980·594	+ 1·865	1982·46	4	...	...		...	...	Im. 2–3, St. 2–3.
280		+16°·247	4 6 29·5	1210·357	+ 1·220	1211·58	4	...	...		...	...	,,
281		,,	4 17 46·5	1207·147	+ 1·317	1208·46	4	...	...		...	..	,,
282		+17°·315	4 30 56·5	1989·714	+ 2·432	1992·15	4	...	...		...	...	,,
283	Dec. 8	Standards	2 57 41	6517·257	+ 4·492	6521·75	4	...	...		...	...	Im. 2, St. 2–3.
284		+16°·247	3 11 38·5	852·983	+ 0·637	853·62	4	...	...		...	...	Im. 1–2, St. 1–2.
285	Obs. Finlay	,,	3 25 26·5	849·537	+ 0·677	850·21	4	...	...		...	...	,,
286		,,	4 10 26	838·677	+ 0·875	839·55	4	...	...		...	...	Im. 2, St. 2.
287		,,	4 22 15	835·375	+ 0·955	836·33	4	...	...		...	...	,,
288	Dec. 9	+16°·247	3 47 33	473·590	+ 0·422	474·01	4	...	...		...	...	Im. 2, St. 2.
289		Standards	3 56 45·5	6515·530	+ 6·442	6521·97	4	...	...		...	...	m. 2–3, St. 3–4.
290	Obs. Gill	+16°·247	4 5 11	469·229	+ 0·465	469·69	4	...	...		...	...	Im. 2–3, St. 2–3.
291		,,	4 13 24·5	467·156	+ 0·487	467·64	4	...	...		...	...	,,
292		,,	4 22 8·5	464·907	+ 0·507	465·41	4	...	...		...	...	,,
293		,,	4 30 53·5	462·789	+ 0·530	463·32	4	...	...		...	...	,,
294	Dec. 10	+16°·247	3 22 5	181·189	+ 0·100	181·29	4	...	...		...	...	Im. 1–2, St. 1–2.
295		,,	3 29 31	180·309	+ 0·090	180·40	4	...	...		...	...	,,
296	Obs. Gill	,,	3 36 4·5	179·678	+ 0·090	179·77	4	...	...		...	...	,,
297		,,	3 43 20·5	179·314	+ 0·090	179·40	4	...	...		...	...	,,
298		,,	3 48 55·5	178·951	+ 0·087	179·04	4	...	...		...	...	,,
299		,,	3 56 5·5	178·131	+ 0·080	178·21	4	...	...		...	...	,,
300		,,	4 2 5	...	...	...	...	30 20 45	−36 5	− 50	29 43 50	4	,,
301		,,	4 10 36	...	...	...	...	31 11 53	−36 4	− 50	30 34 59	4	Im. 1, St. 3.
302		Standards	4 31 53·5	...	...	...	...	136 32 12	−36 11	+ 24	135 56 25	4	,,
303		,,	4 44 55	6512·304	+10·035	6522·34	4	...	...		...	...	,,
304		+16°·247	4 56 37·5	...	...	...	...	214 47 23	−35 56	− 51	214 10 36	4	Im. 1, St. 1.
305		,,	5 8 59	...	...	...	...	215 53 53	−35 55	− 47	215 17 11	4	,,
306		,,	5 14 7	...	...	...	...	216 23 26	−35 54	− 46	215 46 46	4	,,
307		,,	5 18 49·5	...	...	...	...	216 47 33	−35 53	− 43	216 10 57	4	,,
308		,,	5 23 52	...	...	...	...	217 8 38	−35 52	− 41	216 32 5	4	,,
309		,,	5 29 53·5	...	...	...	...	217 44 34	−35 51	− 36	217 8 7	4	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″	″	° ′ ″		
1	Sept. 27	Standards	21 37 26	300·2044	+0·3518	6521·94	4	...	...		...	...	Tel. West.
2		"	21 52 39	...	...	...	...	...	−160	+ 32	45 56 22	4	"
3	Obs. Peter	"	22 12 7	...	...	...	...	...	−156	+ 29	225 56 6	4	"
4		"	22 26 39	300·1968	+ ·2356	6521·78	4	...	...		...	...	"
5		"	22 49 27	300·2190	+ ·2032	6522·26	4	...	...		...	...	Tel. East.
6		"	23 2 45	...	...	...	...	...	+ 65	+ 23	225 56 19	4	"
7		"	23 18 47	...	...	...	...	...	+ 68	+ 22	45 56 15	4	"
8		"	23 33 52	300·1982	+ ·1602	6521·81	4	...	...		...	...	"
9	Oct. 1	Standards	21 29 59	300·1929	+0·3758	6521·69	4	...	...		...	...	Tel. West.
10		"	21 43 6	...	...	...	...	...	−162	+ 33	45 56 7	4	"
11	Obs. Peter	"	22 0 41	...	...	...	...	...	−159	+ 30	225 56 8	4	"
12		"	22 13 23	300·1917	+ ·2571	6521·66	4	...	...		...	...	"
13		"	22 32 41	300·2154	+ ·2235	6522·18	4	...	...		...	...	Tel. East.
14		"	22 45 5	...	...	...	...	...	+ 60	+ 24	225 56 17	4	"
15		"	23 5 41	...	...	...	...	...	+ 66	+ 23	45 56 5	4	"
16		"	23 20 48	300·1822	+ ·1686	6521·46	4	...	...		...	...	"
17	Oct. 4	Standards	21 33 40	300·2024	+0·3597	6521·90	4	...	...		...	...	Tel. East.
18		"	21 49 22	...	...	...	...	...	+ 50	+ 32	225 56 16	4	"
19	Obs. Peter	"	22 7 47	...	...	...	...	...	+ 52	+ 29	45 56 14	4	"
20		"	22 23 36	300·1856	+ ·2347	6521·53	4	...	...		...	...	"
21		"	22 45 59	300·2251	+ ·2029	6522·39	4	...	...		..	...	Tel. West.
22		"	23 1 4	...	...	...	...	...	−143	+ 23	45 56 20	4	"
23		"	23 18 26	...	...	...	...	...	−137	+ 22	225 56 17	4	"
24		"	23 32 26	300·1939	+ ·1574	6521·71	4	...	...		...	...	"
25	Oct. 18	+24°·358	20 59 20	235·5665	+0·3979	5117·68	4	...	...		...	...	Tel. West.
26		+22°·372	21 25 28	196·0003	+ ·2777	4258·11	4	...	...		...	...	"
27	Obs. Peter	"	21 50 31	196·0881	+ ·2156	4260·01	4	...	...		...	...	"
28		+24°·358	22 4 27	235·5180	+ ·2099	5116·63	4	...	...		...	...	"
29		"	22 23 48	233·5080	+ ·1818	5116·41	4	...	...		...	...	Tel. East.
30		+22°·372	22 38 1	196·2628	+ ·1490	4263·81	4	...	...		...	...	"
31		"	22 52 38	196·2970	+ ·1357	4264·55	4	...	...		...	...	"
32		+24°·358	23 7 6	235·4624	+ ·1404	5115·42	4	...	...		...	...	"
33	Oct. 24	+22°·354	20 58 30	...	...	...	...	...	− 38	−105	284 9 26	4	Tel. East.
34		"	21 20 50	14·9185	+0·0088	324·10	4	...	...		...	...	"
35	Obs. Peter	Standards	21 40 55	300·2160	+ ·3429	6522·19	4	...	...		...	...	"
36		"	21 54 7	...	...	...	...	...	− 34	+ 32	225 56 36	4	"
37		+22°·354	22 12 25	15·8675	+ ·0065	344·72	4	...	...		...	...	"
38		"	22 27 49	...	...	...	...	...	− 29	− 12	289 40 40	4	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
39	Oct. 25	Standards	20 46 5	...	...	...	...	...	−252	+ 56	45 56 14	4	Tel. West.
40		+22°·347	21 5 25	82·2156	+0·0262	1786·13	2	...	...		...	...	„
41	Obs. Peter	„	21 15 45	...	...	...	...	...	−256	− 7	308 1 12	4	„
42		+22°·354	21 34 16	...	...	...	...	...	−254	+ 23	315 13 20	4	„
43		„	21 47 10	48·7851	+ ·0136	1059·86	2	...	...		...	...	„
44		„	21 54 34	48·9975	+ ·0137	1064·47	2	...	...		...	...	„
45		„	22 3 12	...	...	...	...	...	−250	+ 20	135 25 35	4	„
46		+22°·347	22 23 28	...	...	...	...	...	−246	+ 9	127 36 55	4	„
47		„	22 32 10	80·1239	+ ·0239	1740·69	2	...	...		...	...	„
48		Standards	22 47 57	...	...	...	...	...	−231	+ 24	225 50 17	4	„
49		„	23 0 42	...	...	...	...	...	−227	+ 23	45 56 22	4	„
50	Oct. 26	Standards	20 23 12	300·2021	+0·8770	6521·89	4	...	...		...	...	Tel. East.
51		„	20 37 11	...	...	...	...	...	− 39	+ 62	255 56 10	4	„
52	Obs. Peter	+22°·347	20 57 49	...	...	...	...	...	− 39	− 77	294 35 56	4	„
53		„	21 19 9	48·5834	+ ·0221	1055·47	4	...	...		...	...	„
54		„	21 39 34	48·1694	+ ·0201	1046·48	4	...	...		...	...	„
55		„	21 58 28	...	...	...	...	...	− 34	− 28	113 34 25	4	„
56		Standards	22 28 7	...	...	...	...	...	− 28	+ 38	45 56 21	4	„
57	Oct. 28	+20°·404	20 31 57	251·5155	+0·6572	5464·17	4	...	...		...	...	Tel. West.
58		+22°·331	20 46 31	198·2651	+ ·3387	4307·31	4	...	...		...	...	„
59	Obs. Peter	„	21 3 49	198·0368	+ ·2763	4302·35	4	...	...		...	...	„
60		+20°·404	21 25 21	251·4492	+ ·3320	5462·73	4	...	...		...	...	„
61		„	21 44 47	251·4487	+ ·2741	5462·72	4	...	...		...	...	Tel. East.
62		+22°·331	22 4 51	197·2519	+ ·1574	4285·30	4	...	...		...	...	„
63		„	22 29 38	196·9131	+ ·1317	4277·94	4	...	...		...	...	„
64		+20°·404	22 50 19	251·3939	+ ·1685	5461·53	4	...	...		...	...	„
65	Nov. 5	+21°·321	20 29 22	40·3910	+0·0956	877·49	4	...	...		...	...	Tel. West.
66		„	20 49 49	...	...	...	...	...	−254	+147	208 50 8	4	„
67	Obs. Peter	Standards	21 13 37	...	...	...	...	...	−250	+ 44	225 56 18	4	„
68		„	21 30 35	300·2039	+ ·3896	6521·93	4	...	...		...	...	„
69		+21°·321	21 50 8	39·6027	+ ·0360	860·37	4	...	...		...	...	„
70		„	22 3 50	...	...	...	...	...	−244	+ 53	211 28 42	4	„
71	Nov. 7	+19°·340	20 42 16	262·1437	+0·4036	5695·07	4	...	...		...	...	Tel. East.
72		+21°·304	20 59 21	222·7763	+ ·3732	4839·82	4	...	...		...	...	„
73	Obs. Peter	„	21 15 56	222·8510	+ ·3101	4841·44	4	...	...		...	...	„
74		+19°·340	21 29 36	261·3719	+ ·2409	5678·30	4	...	...		...	...	„

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	′		° ′ ″	″ ″	° ′ ″		
75	Nov. 8	+21°·304	20 34 15	232·2647	+0·5013	5045·95	4	...	...	...	...	Tel. West.
76		+19°·340	20 47 38	239·5332	+ ·3939	5203·86	4	...	...	...	...	"
77	Obs. Peter	"	21 1 10	239·3510	+ ·3329	5199·90	4	...	...	...	...	"
78		+21°·304	21 13 36	232·6040	+ ·3090	5053·32	4	...	...	...	...	"
79		"	21 31 48	232·7575	+ ·2585	5056·66	4	...	...	...	...	Tel. East.
80		+19°·340	21 48 16	238·7032	+ ·2112	5185·83	4	...	...	...	...	"
81		"	22 3 45	238·4982	+ ·1889	5181·37	4	...	...	...	...	"
82		+21°·304	22 22 29	233·1923	+ ·1748	5066·10	4	...	...	...	...	"
83	Nov. 9	+19°·340	20 40 29	220·9898	+0·4542	4801·00	4	...	...	...	...	Tel. East.
84		+21°·304	20 57 10	247·7831	+ ·3561	5383·09	4	...	...	...	...	"
85	Obs. Peter	"	21 10 15	247·9707	+ ·3106	5387·16	4	...	...	...	...	"
86		+19°·340	21 23 48	220·5275	+ ·2697	4790·96	4	...	...	...	...	"
87		"	21 45 37	220·2956	+ ·2203	4785·92	4	...	...	...	...	Tel. West.
88		+21°·304	22 1 22	248·5555	+ ·1981	5399·87	4	...	...	...	...	"
89		"	22 17 29	248·7657	+ ·1781	5404·43	4	...	...	...	...	"
90		+19°·340	22 27 35	219·8276	+ ·1522	4775·75	4	...	...	...	...	"
91	Nov. 10	+20°·341	20 27 22	182·9583	+0·3734	3974·77	4	...	...	...	...	Tel. West.
92		+19°·340	20 41 16	207·0565	+ ·4656	4498·30	4	...	...	...	...	"
93	Obs. Peter	"	20 53 49	206·9456	+ ·3924	4495·89	4	...	...	...	...	"
94		+20°·341	21 5 35	182·5059	+ ·2348	3964·94	4	...	...	...	...	"
95		"	21 18 6	182·3461	+ ·2068	3961·47	4	...	...	...	...	"
96		+19°·340	21 30 6	206·6929	+ ·2605	4490·40	4	...	...	...	...	"
97	Nov. 11	+19°·340	20 40 52	198·4971	+0·4738	4312·35	...	...	...	...	...	Tel. East.
98		+20°·341	20 54 51	169·1707	+ ·2805	3675·23	...	...	...	...	...	"
99	Obs. Peter	"	21 6 5	169·1002	+ ·2470	3673·70	...	...	...	...	...	"
100		+19°·340	21 18 58	198·3699	+ ·2946	4309·59	...	...	...	...	...	"
101		"	21 33 42	198·3113	+ ·2528	4308·31	...	...	...	...	...	Tel. West.
102		+20°·341	21 47 13	168·7924	+ ·1652	3667·01	...	...	...	...	...	"
103		"	21 57 17	168·7332	+ ·1520	3665·73	...	...	...	...	...	"
104		+19°·340	22 10 40	198·2133	+ ·1830	4306·18	...	...	...	...	...	"
105	Nov. 12	+20°·341	20 32 55	163·3862	+0·3914	3549·57	4	...	...	...	...	Tel. West.
106		+19°·340	20 46 26	195·7322	+ ·4322	4252·28	4	...	...	...	...	"
107	Obs. Peter	"	21 0 41	195·7507	+ ·3597	4252·68	4	...	...	...	...	"
108		+20°·341	21 18 7	163·3310	+ ·2259	3548·37	4	...	...	...	...	"
109		"	21 42 0	163·3011	+ ·1790	3547·72	4	...	...	...	...	Tel. East.
110		+19°·340	21 57 7	195·7915	+ ·2011	4253·57	4	...	...	...	...	"
111		"	22 11 20	195·8132	+ ·1792	4254·04	4	...	...	...	...	"
112		+20°·341	22 24 30	163·2257	+ ·1283	3546·08	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″	″	° ′ ″		
115	Nov. 14	+18°·283	20 46 15	136·0101	+0·2283	2954·82	4	...	...		...	...	Tel. East.
116		+20°·341	20 59 39	175·1793	+ ·2859	3805·77	4	...	...		...	...	"
117	Obs. Peter	"	21 16 40	175·3432	+ ·2366	3809·33	4	...	...		...	...	"
118		+18°·283	21 30 9	135·4134	+ ·1410	2941·86	4	...	...		...	...	"
119		"	21 45 17	135·1886	+ ·1237	2936·97	4	...	...		...	...	Tel. West.
120		+20°·341	21 56 29	175·6605	+ ·1650	3816·22	4	...	...		...	...	"
121		"	22 9 11	175·7796	+ ·1494	3818·81	4	...	...		...	...	"
122		+18°·283	22 25 22	134·6402	+ ·0944	2925·05	6	...	...		...	...	"
123	Nov. 15	+20°·341	20 48 14	190·4809	+0·3242	4138·20	4	...	...		...	...	Tel. West.
124		+18°·283	21 7 48	117·6897	+ ·1812	2556·81	4	...	...		...	...	"
125	Obs. Peter	"	21 21 40	117·5615	+ ·1557	2554·02	4	...	...		...	...	"
126		+20°·341	21 32 6	190·9914	+ ·2024	4149·29	4	...	...		...	...	"
127		"	21 47 33	191·1646	+ ·1777	4153·05	4	...	...		...	...	Tel. East.
128		+18°·283	21 58 32	117·2012	+ ·1115	2546·20	4	...	...		...	...	"
129		"	22 8 33	117·1111	+ ·1033	2544·24	4	...	...		...	...	"
130		+20°·341	22 18 31	191·5383	+ ·1428	4161·17	4	...	...		...	...	"
131	Nov. 17	+18°·283	20 57 53	104·1584	+0·1909	2262·84	4	...	...		...	...	Tel. East.
132		+19°·329	21 11 46	97·9969	+ ·1429	2128·98	4	...	...		...	...	"
133	Obs. Peter	"	21 29 46	98·0040	+ ·1190	2129·14	4	...	...		...	...	"
134		+18°·283	21 56 48	104·2726	+ ·1039	2265·32	4	...	...		...	...	"
135		"	22 10 52	104·2992	+ ·0926	2265·90	4	...	...		...	...	Tel. West.
136		+19°·329	22 21 30	97·9757	+ ·0769	2128·52	4	...	...		...	...	"
137	Nov. 18	+18°·277	20 50 43	...	...	...	...	...	—250	—105	112 11 17	4	Tel. West.
138		"	21 3 8	59·0984	+0·0330	1283·91	4	...	...		...	...	"
139	Obs. Peter	Standards	21 15 42	300·2156	+ ·4434	6522·18	4	...	...		...	...	"
140		"	21 29 33	...	...	...	...	...	—249	+ 37	45 56 12	4	"
141		+18°·277	21 45 30	58·2409	+ ·0264	1265·28	4	...	...		...	...	"
142		"	21 1 13	...	...	...	...	...	—240	— 37	111 47 56	4	"
143	Nov. 29	+17°·315	21 24 10	...	...	...	...	...	— 38	— 86	282 17 51	4	Tel. East.
144		"	21 39 41	56·8866	+0·0347	1235·86	4	...	...		...	...	"
145	Obs. Peter	Standards	21 57 21	300·2005	+ ·2922	6521·86	4	...	...		...	...	"
146		"	22 10 15	...	...	...	...	...	— 32	+ 29	225 56 11	4	"
147		+17°·315	22 27 10	56·2264	+ ·0274	1221·52	4	...	...		...	...	"
148		"	22 39 31	...	...	...	...	...	— 25	— 32	282 17 22	4	"
149	Dec. 3	+17°·315	21 48 38	...	...	...	...	...	—240	— 8	59 17 53	4	Tel. West.
150		"	22 4 29	21·0778	+0·0209	457·91	4	...	...		...	...	"
151	Obs. Peter	Standards	22 24 43	300·2260	+ ·2417	6522·41	4	...	...		...	...	"
152		"	22 36 49	...	...	...	...	...	—234	+ 26	45 56 20	4	"
153		+17°·315	22 54 2	21·6184	+ ·0153	469·66	4	...	...		...	...	"
154		"	23 5 29	...	...	...	...	...	—222	+ 4	60 16 26	4	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
155	Dec. 5	+17°·315	21 30 35	54·2161	+0·0662	1177·84	4	...	...		...	...	Tel. East.
156		,,	21 43 3	...	...	...	...	...	− 36	− 40	69 41 54	4	,,
157	Obs. Peter	Standards	21 59 39	...	...	...	...	...	− 33	+ 31	45 56 11	4	,,
158		,,	22 13 2	300·1921	+ ·2652	6521·67	4	...	...		...	...	,,
159		+17°·315	22 31 12	...	...	...	...	...	− 27	− 16	69 45 15	4	,,
160		,,	22 46 48	55·0847	+ ·0386	1196·71	4	...	...		...	...	,,
161	Dec. 6	+17°·315	21 32 2	71·0553	+0·0874	1543·68	4	...	...		...	..	Tel. West.
162		+16°·247	21 41 34	76·1264	+ ·0939	1653·85	4	...	...		...	...	,,
163	Obs. Peter	,,	21 50 59	76·0260	+ ·0840	1651·66	4	...	...		...	...	,,
164		+17°·315	22 1 57	71·3932	+ ·0676	1551·02	4	...	...		...	...	..
165		,,	22 16 45	71·5603	+ ·0609	1554·65	4	...	...		...	...	Tel. East.
166		+16°·247	22 30 45	75·5801	+ ·0628	1641·98	4	...	...		...	...	,,
167		,,	22 43 37	75·4401	+ ·0576	1638·94	4	...	...		...	...	,
168		+17°·315	23 1 8	72·0563	+ ·0473	1665·42	4	...	...		...	...	
169	Dec. 7	+16°·247	21 37 38	59·3486	+0·0768	1289·35	4	...	...		...	...	Tel. East.
170		+17°·315	21 49 39	88·0167	+ ·0934	1912·16	4	...	...		...	...	,,
171	Obs. Peter	,,	22 0 28	88·1278	+ ·0851	1914·58	4	...	...		...	...	
172		+16°·247	22 15 50	58·9283	+ ·0546	1280·22	4	...	...		...	...	,,
173		,,	22 32 12	58·7344	+ ·0486	1276·00	4	...	...		...	...	Tel. West.
174		+17°·315	22 49 33	88·6718	+ ·0623	1926·39	4	...	...		...	...	,,
175	Dec. 8	Standards	21 19 8	300·1847	+0·4357	6521·51	4	...	...		...	...	Tel. West.
176		,,	21 29 35	...	...	...	...	...	−249	+ 38	45 56 8	4	
177	Obs. Peter	+16°·247	21 47 33	...	...	...	...	...	−240	− 9	59 5 56	4	
178		,,	21 59 32	42·0837	+ ·0446	914·27	4	...	...		...	...	,,
179		,,	22 11 5	41·9523	+ ·0405	911·41	4	...	...		...	...	
180		,,	22 20 52	...	...	...	...	...	−232	− 1	239 7 56	4	
181		Standards	22 36 32	...	...	...	...	...	−235	+ 26	225 56 11	4	
182		,,	22 48 2	300·1836	+ ·2097	6521·49	4	...	...		...	...	
185	Dec. 13	Standards	21 31 26	...	...	...	...	...	− 37	+ 37	225 56 10	4	Tel. East.
186		,,	21 43 50	300·1749	+0·3412	6521·30	4	...	...		...	...	,,
187	Obs. Peter	+16°·247	22 1 49	53·1679	+ ·0525	1155·07	4	...	...		...	...	,,
188		,,	22 12 14	...	...	...	...	...	− 31	+ 68	208 38 54	4	,,
189		,,	22 28 34	...	...	...	...	...	− 28	+ 59	28 38 55	4	,,
190		,,	22 41 17	53·6900	+ ·0393	1166·42	4	...	...		...	...	,,
191		Standards	22 54 14	300·1906	+ ·2022	6521·64	4	...	...		...	...	,,
192		,,	23 6 37	...	...	...	...	...	− 19	+ 23	45 56 14	4	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	° ′ ″	″	° ′ ″		
1	Oct. 30	+22°·331	23 25 52	128·9981	+0·0700	3796·41	8	...	...		...	...	Tel. East.
2		+22°·404	0 50 44	191·8539	+ ·0774	5646·26	9	...	...		...	...	"
3	Obs. Stone	"	2 28 53	192·4005	+ ·0615	5662·35	8	...	...		...	...	Tel. West.
4		+22°·331	3 40 34	128·6451	+ ·0400	3786·02	8	...	...		...	...	"
5	Nov. 13	+20°·341	22 50 17	122·8086	+0·0802	3614·25	8	...	...		...	...	Tel. East.
6		+19°·340	0 17 45	147·6232	+ ·0630	4344·55	9	...	...		...	...	"
7	Obs. Stone	"	1 45 54	148·0245	+ ·0480	4356·36	8	...	...		...	...	Tel. West.
8		+20°·341	2 59 35	123·6339	+ ·0410	3638·55	8	...	...		...	...	"
9	Nov. 16	+19°·329	0 23 54	74·6740	+0·0284	2197·66	9	...	...		...	...	Tel. East.
10		+18°·283	1 32 40	77·9482	+ ·0287	2294·02	8	...	...		...	...	"
11	Obs. Stone	"	2 43 3	77·8472	+ ·0255	2291·04	8	...	...		...	...	Tel. West.
12		+19°·329	4 1 4	73·7079	+ ·0210	2169·22	12	...	...		...	...	"
13	Nov. 20	+18°·277	0 3 37	10·6333	+0·0041	312·94	10	39 51 12	+62 49 0	+34	102 40 46	10	Tel. East.
14		Standards	1 32 16	221·6004	+ ·0653	6521·70	8	73 8 23	"	+12	135 57 35	8	"
15	Obs. Stone	"	2 46 57	221·5990	+ ·0576	6521·66	8	73 36 53	+62 19 30	+ 7	135 56 30	8	Tel. West.
16		+18°·277	4 14 15	12·6055	+ ·0044	370·98	10	24 25 48	"	—30	86 44 48	10	"
17	Dec. 6	+16°·247	0 57 42	54·1247	+0·0237	1592·89	9	86 13 38	+62 49 0	+13	149 2 51	9	Tel. East.
18		Standards	3 50 31	221·6487	+ ·0679	6523·12	10	73 5 52	"	+ 3	135 54 55	10	"
19	Obs. Stone	"	5 57 2	221·6398	+ ·0640	6522·86	8	73 36 52	+62 19 30	— 7	135 56 15	8	Tel. West.
20		+16°·247	7 15 38	50·9020	+ ·0250	1498·05	6	86 10 18	"	+99	148 31 27	6	"
21	Dec. 9	+16°·247	2 5 6	15·9108	+0·0065	468·25	11	94 9 4	+62 19 30	+11	156 28 45	11	Tel. West.
22		"	3 44 0	15·0821	+ ·0058	443·87	8	94 17 29	+62 49 0	+16	157 6 45	8	Tel. East.
23	Obs. Stone	Standards	5 1 35	221·6480	+ ·0667	6523·10	8	93 6 31	"	— 2	135 55 29	8	"
24		"	6 33 43	221·6709	+ ·0688	6523·78	9	73 36 14	+62 19 30	—10	135 55 34	9	Tel. West.

NOTE.—In the Leipzig and Oxford observations the column "Measured Distance" contains the result corrected for refraction. In the Yale results this is not the case.

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
1	Oct. 10	+24°·376	21 47 50	91·917·	+0·097	1166·90	4	...	...		...	...	Tel. West.
2		"	47 53	...	...	...	...	14 48 45	−175	+ 91	14 47 21	4	"
3	Obs. Elkin	"	55 44	91·780·	+ ·089	1165·06	4	...	...		...	...	"
4		"	55 47	...	...	...	...	14 53 45	−171	+ 82	14 52 16	4	"
5		Standards	22 10 57	513·824·	+ ·423	6521·47	4	...	...		...	...	"
6		"	10 33	...	...	...	...	45 58 13	−154	+ 6	45 55 45	4	"
7		+24°·376	23 32	91·214·	+ ·069	1157·61	4	...	...		...	...	"
8		"	23 44	...	...	...	...	195 9 45	−157	+ 59	195 8 7	4	"
9		"	30 25	91·071	+ ·065	1155·75	4	...	...		...	...	"
10		"	30 23	...	...	...	...	195 14 56	−154	+ 55	195 13 17	4	"
11	Oct. 10	+24°·376	6 26 1	81·339·	+0·035	1031·95	4	...	...		...	...	Tel. East.
12		"	26 4	...	...	...	...	201 0 34	+ 51	− 68	201 0 17	4	"
13	Obs. Elkin	"	32 4	81·238	+ ·036	1030·68	4	...	...		...	...	"
14		"	32 8	...	...	...	...	201 4 41	+ 51	− 71	201 4 21	4	"
15		Standards	43 27	514·049·	+ ·157	6520·95	4	...	...		...	...	"
16		"	43 18	...	...	...	...	225 56 5	+ 50	− 55	225 56 0	4	"
17		+24°·376	54 9	80·823·	+ ·040	1025·47	4	...	...		...	...	"
18		"	54 15	...	...	...	...	21 24 34	+ 52	− 90	21 23 40	4	"
19		"	7 0 52	80·717	+ ·041	1024·14	4	...	...		...	...	"
20		"	0 57	...	...	...	...	21 29 49	+ 52	− 98	21 29 2	4	"
21	Oct. 11	+24°·376	21 36 14	68·066·	+0·089	864·33	4	...	...		...	...	Tel. West.
22		"	36 43	...	...	...	...	35 34 26	−181	+ 26	35 31 51	4	"
23	Obs. Elkin	"	53 13	67·887·	+ ·073	861·85	4	...	...		...	...	"
24		"	54 28	...	...	...	...	215 55 15	−172	+ 24	215 52 47	4	"
25		Standards	23 14 6	514·043	+ ·268	6522·28	4	...	...		...	...	"
26		"	13 33	...	...	...	...	225 57 46	−124	+ 9	225 55 51	4	"
27		+24°·376	23 50	66·685·	+ ·034	846·10	4	...	...		...	...	"
28		"	23 57	...	...	...	...	217 44 52	−127	+ 13	217 42 58	4	"
29		"	30 45	66·640·	+ ·033	845·53	4	...	...		...	...	"
30		"	30 49	...	...	...	...	37 55 26	−124	+ 12	37 53 34	4	"
31	Oct. 15	+24°·358	1 37 54	424·338	+0·136	5383·01	4	...	...		...	...	Tel. West.
32		+22°·372	45 4	342·593·	+ ·110	4346·02	4	...	...		...	...	"
33	Obs. Elkin	"	49 26	342·557·	+ ·109	4345·57	4	...	...		...	...	"
34		+24°·358	55 7	424·178·	+ ·132	5380·93	4	...	...		...	...	"
35		"	2 1 52	424·071·	+ ·130	5379·56	4	...	...		...	...	"
36		+22°·372	8 8	342·443·	+ ·108	4344·09	4	..	...		...	...	"
37		"	12 51	342·358	+ ·107	4343·00	4	...	...		...	...	"
38		+24°·358	19 10	423·878	+ ·127	5377·06	4	...	...		...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″ ″	° ′ ″		
39	Oct. 16	+22°·372	22 1 21	335·056·	+0·269	4252·47	4	...	...	...	...	Tel. West.
40		+24°·358	11 51	413·178	+ ·343	5244·11	4	...	...	...	...	"
41	Obs. Elkin	"	15 4	413·123·	+ ·330	5243·26	4	...	...	...	...	"
42		+ ·372	20 32	335·077	+ ·227	4252·19	4	...	...	...	...	"
43		"	38 19	335·012	+ ·199	4251·01	4	...	...	...	...	"
44		+24°·358	42 37	412·905	+ ·264	5239·64	4	...	...	...	...	"
45		"	46 8	412·871	+ ·258	5239·13	4	...	...	...	...	"
46		+22°·372	50 45	334·973	+ ·184	4250·33	4	...	...	...	...	"
47		+24°·358	1 9 44	411·657	+ ·114	5221·91	4	...	...	...	...	"
48		+22°·372	13 39	334·767	+ ·137	4247·12	4	...	...	...	...	"
49		"	16 56	334·762	+ ·136	4247·04	4	...	...	...	...	"
50		+24°·358	21 33	411·570	+ ·111	5220·77	4	...	...	...	...	"
51	Oct. 16	+24°·376	23 16 0	201·732	+0·059	2545·85	4	...	...	...	...	Tel. West.
52		+22°·354	38 48	407·969	+ ·131	5174·35	4	...	...	...	...	"
53	Obs. Hall	"	48 19	407·626	+ ·128	5169·96	4	...	...	...	...	"
54		+24°·376	24 1 29	203·437	+ ·058	2567·46	4	...	...	...	...	"
55	Oct. 17	+24°·358	21 45 52	405·022	+0·413	5141·56	4	...	...	...	...	Tel. West.
56		+22°·372	50 33	332·531	+ ·331	4221·22	4	...	...	...	...	"
57	Obs. Elkin	"	53 16	332·594	+ ·321	4221·89	4	...	...	...	...	"
58		+24°·358	56 28	404·989	+ ·368	5140·57	4	...	...	...	...	"
59		"	22 0 33	404·966·	+ ·354	5140·12	4	...	...	...	...	"
60		+22°·372	4 8	332·651	+ ·288	4222·20	4	...	...	...	...	"
61		"	7 21	332·653	+ ·279	4222·12	4	...	...	...	...	"
62		+24°·358	11 9	404·962	+ ·321	5139·65	4	...	...	...	...	"
63		"	14 43	404·965	+ ·312	5139·56	4	...	...	...	...	"
64		+22°·372	18 21	332·729	+ ·253	4222·76	4	...	...	...	...	"
65		"	21 46	332·678	+ ·246	4222·01	4	...	...	...	...	"
66		+24°·358	26 43	404·949	+ ·282	5138·98	4	...	...	...	...	"
67		"	23 53 25	404·605	+ ·171	5133·21	4	...	...	...	...	"
68		+22°·372	57 11	333·054	+ ·141	4225·45	4	...	...	...	...	"
69		"	0 0 12	333·026	+ ·140	4225·06	4	...	...	...	...	"
70		+24°·358	0 3 12	404·564	+ ·165	5132·61	4	...	...	...	...	"
71	Oct. 17	+24°·376	22 38 51	247·982·	+0·088	3145·31	4	...	...	...	...	Tel. West.
72		+22°·354	50 20	359·525	+ ·127	4560·06	4	...	...	...	...	"
73	Obs. Hall	"	57 42	359·240·	+ ·123	4556·40	4	...	...	...	...	"
74		+24°·376	23 6 39	247·964·	+ ·083	3157·70	4	...	...	...	...	"
75		"	19 2	248·381	+ ·081	3162·96	4	...	...	...	...	"
76		+22°·354	28 11	358·133	+ ·116	4542·27	4	...	...	...	...	"
77		"	35 49	357·858·	+ ·114	4538·76	4	...	...	...	...	"
78		+24°·376	44 20	250·280·	+ ·078	3174·32	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
79	Oct. 17	+22°·354	5 33 39	344·296	+0·184	4367·69	4	...	...	...	...	Tel. East.
80		+24°·376	45 22	263·452·	+ ·147	3342·20	4	...	...	...	...	"
81	Obs. Hall	"	53 55	263·758·	+ ·156	3346·19	4	...	...	...	...	"
82		+22°·354	6 4 14	343·110·	+ ·226	4353·19	4	...	...	...	...	"
83		"	18 56	342·508	+ ·253	4345·90	4	...	...	...	...	"
84		+24°·376	30 55	265·053·	+ ·207	3363·26	4	...	...	...	...	"
85		"	38 17	265·294	+ ·221	3366·49	4	...	...	...	...	"
86		+22°·354	51 58	341·202·	+ ·340	4330·44	4	...	...	...	...	"
87	Oct. 18	+22°·372	21 37 49	337·272	+0·421	4282·50	4	...	...	...	...	Tel. West.
88		+24°·358	42 9	403·266	+ ·398	5119·10	4	...	...	...	...	"
89	Obs. Elkin	"	45 21	403·288	+ ·383	5119·21	4	...	...	...	...	"
90		+22°·372	49 43	337·476	+ ·367	4284·39	4	...	...	...	...	"
91		"	54 17	337·457	+ ·349	4283·93	4	...	...	...	...	"
92		+24°·358	58 2	403·294	+ ·337	5118·69	4	...	...	...	...	"
93		"	22 1 3	403·304	+ ·328	5118·70	4	...	...	...	...	"
94		+22°·372	5 7	337·576	+ ·312	4284·97	4	...	...	...	...	"
95		+24°·358	23 25 1	403·453	+ ·186	5118·79	4	...	...	...	..	"
96		+22°·372	28 48	338·393	+ ·170	4293·52	4	...	...	...	...	"
97		"	32 4	338·423	+ ·167	4293·86	4	...	...	...	...	"
98		+24°·358	35 53	403·433	+ ·177	5118·43	4	...	...	...	...	"
99		"	39 38	403·453	+ ·175	5118·65	4	...	...	...	...	"
100		+22°·372	42 53	338·488	+ ·158	4294·59	4	...	...	...	...	"
101		"	45 45	338·567	+ ·157	4295·51	4	...	...	...	...	"
102		+24°·358	49 37	403·423	+ ·168	5118·18	4	...	...	...	...	"
103	Oct. 18	+24°·376	22 19 38	298·092	+0·096	3780·76	4	...	...	...	...	Tel. West.
104		+22°·354	27 40	308·473	+ ·118	3912·65	4	...	...	...	...	"
105	Obs. Hall	"	32 49	308·325	+ ·116	3910·75	4	...	...	...	...	"
106		+24°·376	40 23	298·877	+ ·095	3790·71	4	...	...	...	...	"
107		"	48 42	299·137·	+ ·094	3793·98	4	...	...	...	...	"
108		+22°·354	55 46	307·418	+ ·108	3899·15	4	...	...	...	...	"
109		"	23 0 42	307·243·	+ ·106	3896·90	4	...	...	...	...	"
110		+24°·376	7 47	299·872·	+ ·092	3803·27	4	...	...	...	...	"
111	Oct. 18	+22°·354	5 47 13	291·366	+0·174	3696·46	4	...	...	...	...	Tel. East.
112		+24°·376	56 21	315·306	+ ·194	4000·25	4	...	...	...	...	"
113	Obs. Hall	"	6 2 40	315·530	+ ·202	4003·21	4	...	...	...	...	"
114		+24°·354	11 37	290·402	+ ·208	3684·68	4	...	...	...	...	"
115		"	19 49	290·086	+ ·221	3680·83	4	...	...	...	...	"
116		+24°·376	27 46	316·466	+ ·246	4015·64	4	...	...	...	...	"
117		"	35 20	316·734·	+ ·263	4019·24	4	...	...	...	...	"
118		+22°·354	45 26	289·072	+ ·276	3668·67	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″ ″	° ′ ″		
119	Oct. 20	+24°·376	5 53 3	424·962	+0·253	5378·67	4	...	...	...	...	Tel. East.
120		+22°·354	6 3 38	181·110	+ ·120	2297·84	4	...	...	...	...	"
121	Obs. Hall	"	11 22	180·822	+ ·127	2294·27	4	...	...	...	...	"
122		+24°·376	24 5	426·136	+ ·320	5394·41	4	...	...	...	...	"
123		"	39 0	426·696·	+ ·365	5402·07	4	...	...	...	...	"
124		+22°·354	51 54	179·085	+ ·180	2272·92	4	...	...	...	...	"
125		"	59 39	178·793	+ ·196	2269·42	4	...	...	...	...	"
126		+24°·376	7 17 15	428·084	+ ·545	5421·95	4	...	...	...	...	"
127	Oct. 21	+23°·326	21 43 28	329·137	+0·350	4178·42	4	...	...	...	...	Tel. West.
128		+22°·368	56 11	301·374	+ ·320	3825·96	4	...	...	...	...	"
129	Obs. Elkin	"	22 0 22	301·420	+ ·306	3826·37	4	...	...	...	...	"
130		+23°·326	4 43	329·115	+ ·282	4177·28	4	...	...	...	...	"
131		"	9 40	329·088	+ ·270	4176·79	4	...	...	...	...	"
132		+22°·368	12 52	301·580	+ ·271	3827·95	4	...	...	...	...	"
133		"	15 28	301·639	+ ·265	3828·62	4	...	...	...	...	"
134		+23°·326	19 2	329·070	+ ·249	4176·29	4	...	...	...	...	"
135		"	23 15	329·095	+ ·240	4176·51	4	...	...	...	...	"
136		+22°·368	26 43	301·803	+ ·239	3830·38	4	...	...	...	...	"
137		"	29 12	301·879	+ ·235	3831·29	4	...	...	...	...	"
138		+23°·326	32 54	329·031	+ ·223	4175·47	4	...	...	...	...	"
139		"	37 22	329·060	+ ·216	4175·75	4	...	...	...	...	"
140		+22°·368	23 0 21	302·315	+ ·186	3836·20	4	...	...	...	...	"
141		"	3 12	302·382	+ ·182	3837·01	4	...	...	...	...	"
142		+23°·326	7 25	328·944	+ ·177	4173·79	4	...	..	...	...	"
143	Oct. 21	+24°·376	23 34 8	465·080·	+0·144	5898·62	4	...	...	...	...	Tel. West.
144		+22°·354	48 11	139·998·	+ ·045	1775·62	4	...	...	...	...	"
145	Obs. Hall	"	53 42	139·771	+ ·044	1772·73	4	...	...	...	...	"
146		+24°·376	0 2 6	466·252	+ ·141	5913·45	4	...	...	...	...	"
147		"	9 36	466·546	+ ·140	5917·17	4	...	...	...	...	"
148		+22°·354	17 54	138·794	+ ·043	1760·31	4	...	...	...	...	"
149		"	23 28	138·543·	+ ·042	1757·13	4	...	...	...	...	"
150		+24°·376	31 35	467·456	+ ·139	5928·70	4	...	...	...	...	"
151	Oct. 21	+22°·354	5 35 50	125·376	+0·070	1590·55	4	...	...	...	...	Tel. East.
152		+24°·376	45 29	480·493	+ ·280	6095·77	4	...	...	...	...	"
153	Obs. Hall	"	53 34	480·844	+ ·295	6100·39	4	...	...	...	...	"
154		+22°·354	6 2 54	124·245	+ ·083	1576·37	4	...	...	...	...	"
155		"	12 32	123·826·	+ ·090	1571·14	4	...	...	...	...	"
156		+24°·376	21 3	481·882·	+ ·362	6114·43	4	...	...	...	...	"
157		"	27 23	482·195	+ ·382	6118·64	4	...	...	...	...	"
158		+22°·354	40 36	122·642·	+ ·113	1556·42	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r			° ′ ″	″	″	° ′ ″		
159	Oct. 24	Standards	22 6 54	513·868·	+0·439	6522·23	4	...	...		...	...	Tel. West.
160		"	6 24	...	...	...	...	226 58 50	−156	+ 6	225 56 20	4	"
161	Obs. Elkin	+22°·354	20 51	39·754	+ ·011	504·28	4	...	...		...	...	"
162		"	21 3	...	...	...	...	302 8 0	−155	+ 18	302 5 43	4	"
163		"	27 0	40·001	+ ·012	507·43	4	...	...		...	...	"
164		"	26 56	...	...	...	...	302 19 7	−152	+ 17	302 16 52	4	"
165		"	43 8	40·593	+ ·012	514·94	4	...	...		...	...	"
166		"	42 59	...	...	...	...	122 42 0	−144	+ 15	122 39 50	4	"
167		"	49 49	40·877	+ ·012	518·54	4	...	...		...	...	"
168		"	49 35	...	...	...	...	122 54 45	−140	+ 13	122 52 38	4	"
169		"	55 8	41·081	+ ·012	521·12	4	...	...		...	..	"
170		"	55 20	...	...	...	...	123 3 7	−138	+ 12	123 1 2	4	"
171		"	23 0 20	41·310	+ ·012	524·03	4	...	...		...	...	"
172		"	0 28	...	...	...	...	303 12 48	−135	+ 11	303 10 45	4	"
173		Standards	13 3	514·024	+ ·271	6521·94	4	...	...		...	...	"
174		"	13 4	...	...	...	...	45 57 45	−124	+ 9	45 55 50	4	"
175	Oct. 24	+22°·354	6 13 22	59·358	+0·042	753·29	4	...	...		...	...	Tel. East.
176		"	13 34	...	...	...	...	131 7 0	+ 50	− 1	131 7 49	4	"
177	Obs. Elkin	"	19 31	59·593	+ ·044	756·29	4	...	...		...	...	"
178		"	19 36	...	...	...	...	131 13 45	+ 51	+ 0	131 14 36	4	,
179		"	26 30	59·924	+ ·047	760·54	4	...	...		...	...	"
180		"	26 40	...	...	...	...	311 16 15	+ 51	+ 0	311 17 6	4	"
181		"	32 26	60·157	+ ·050	763·52	4	...	...		...	...	"
182		"	32 30	...	...	...	...	311 23 22	+ 51	+ 0	311 24 14	4	"
183		Standards	50 5	514·126·	+ ·157	6521·93	4	...	...		...	...	"
184		"	50 3	...	...	...	...	226 56 4	+ 50	− 61	225 55 53	4	"
185		+22°·354	7 1 36	61·350	+ ·069	778·89	4	...	...		...	...	"
186		"	1 51	...	...	...	...	131 42 0	+ 52	+ 7	131 42 59	4	"
187		"	7 30	61·622	+ ·074	782·40	4	...	...		...	...	"
188		"	7 36	...	...	...	...	131 44 30	+ 52	+ 9	131 45 31	4	"
189		"	15 3	61·910	+ ·082	786·16	4	...	...		...	...	,
190		"	14 58	...	...	...	...	311 49 23	+ 52	+ 11	311 50 25	4	"
191		"	22 9	62·212	+ ·090	790·09	4	...	...		...	...	"
192		"	22 19	...	...	...	...	301 54 53	+ 52	+ 12	311 55 57	4	"
193	Oct. 25	+22°·354	21 56 56	...	...	...	...	317 4 48	−166	+ 0	317 2 2	4	Tel West.
194		+22°·347	22 1 35	...	...	...	...	305 35 18	−162	+ 27	305 33 3	4	"
195	Obs. Elkin	"	6 44	...	...	...	...	125 32 18	−161	+ 26	125 30 4	4	"
196		+22°·354	12 22	...	...	...	...	137 9 52	−159	+ 2	137 7 15	4	,
197		"	16 57	99·205	+0·031	1258·47	4	...	...		...	...	"
198		"	19 12	99·291	+ ·031	1259·56	4	...	...		...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
199	Oct. 25	+22°·347	22 23 59	123·813	+0·035	1570·59	4	...	...		...	...	Tel. West.
200	(*continued*)	"	26 1	123·765	+ ·035	1569·98	4	...	...		...	...	"
201		"	28 54	123·674	+ ·035	1568·83	4	...	...		...	...	"
202		"	31 52	123·554	+ ·035	1567·31	4	...	...		...	...	"
203		+22°·354	35 31	100·040	+ ·030	1269·05	5	...	...		...	...	"
204		"	38 49	100·178	+ ·030	1270·80	4	...	...		...	...	"
205		"	43 10	...	...	...	...	317 18 33	—144	+ 4	317 16 14	4	"
206		+22°·347	48 48	...	...	...	...	305 12 33	—140	+ 17	305 10 30	4	"
207		"	52 21	...	...	...	...	305 11 3	—138	+ 16	305 9 1	4	"
208		+22°·354	58 26	...	...	...	...	317 22 29	—136	+ 6	317 20 19	4	"
209	Oct. 25	+22°·354	5 58 26	119·751	+0·079	1519·64	4	...	...		...	...	Tel. East.
210		"	58 27	...	...	...	...	138 0 41	+ 49	— 13	139 1 17	4	"
211	Obs. Elkin	+22°·347	6 7 4	104·784	+ ·068	1329·70	4	...	...		...	...	"
212		"	7 8	...	...	...	...	120 53 52	+ 50	+ 12	120 54 54	4	"
213		"	15 23	104·431	+ ·072	1325·26	4	...	...		...	...	"
214		"	15 33	...	...	...	...	300 49 37	+ 50	+ 13	300 50 41	4	"
215		+22°·354	22 47	120·817·	+ ·096	1533·38	4	...	...		...	...	"
216		"	22 49	...	...	...	...	319 5 3	+ 51	— 13	319 5 41	4	"
217		"	29 0	121·087·	+ ·102	1536·87	4	...	...		...	...	"
218		"	29 0	...	...	...	...	319 6 11	+ 51	— 14	319 6 48	4	"
219		+22°·347	37 18	103·548	+ ·085	1314·23	4	...	...		...	...	"
220		"	37 24	...	...	...	...	300 35 29	+ 51	+ 23	300 36 43	4	"
221	Oct. 28	+22°·331	0 26 2	327·758	+0·126	4158·09	4	...	...		...	...	Tel. West.
222		+20°·404	30 59	430·225·	+ ·164	5458·03	4	...	...		...	...	"
223	Obs. Elkin	"	34 20	430·248	+ ·162	5458·29	4	...	...		...	...	"
224		+22°·331	39 13	327·523·	+ ·120	4155·05	4	...	...		...	...	"
225		"	48 49	327·265·	+ ·117	4151·73	4	...	...		...	...	"
226		+20°·404	55 7	430·200·	+ ·154	5457·58	4	...	...		...	...	"
227		"	59 24	430·289·	+ ·152	5458·69	4	...	...		...	...	"
228		+22°·331	1 5 26	326·904	+ ·112	4147·10	4	...	...		...	...	"
229		"	8 51	326·890	+ ·111	4146·90	4	...	...		...	...	"
230		+20°·404	13 38	430·255·	+ ·148	5458·21	4	...	...		...	...	"
231		"	16 58	430·323	+ ·147	5459·05	4	...	...		...	...	"
232		+22°·331	22 30	326·571	+ ·107	4142·80	4	...	...		...	...	"
233	Oct. 29	+22°·331	22 2 17	308·042	+0·276	3909·96	4	...	...		...	...	Tel. West.
234		+20°·404	6 27	433·240	+ ·389	5499·11	4	...	...		...	...	"
235	Obs. Elkin	"	9 9	433·227	+ ·379	5498·82	4	...	...		...	...	"
236		+22°·331	12 29	307·928	+ ·252	3908·21	4	...	...		...	...	"
237		"	16 49	307·806	+ ·242	3906·54	4	...	...		...	...	"
238		+20°·404	21 16	433·416	+ ·340	5500·73	4	...	...		...	...	"
239		"	23 54	433·411	+ ·332	5500·57	4	...	...		...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
240	Oct. 29	+22°·331	22 27 38	307·719	+0·222	3905·18	4	...	...	...	...	Tel. West.
241	(*continued*)	,,	31 7	307·685	+ ·215	3904·68	4	...	...	...	...	,,
242		+20°·404	34 32	433·509	+ ·306	5501·47	4	...	...	...	...	,,
243		,,	37 9	433·520	+ ·300	5501·53	4	...	...	...	...	,,
244		+22°·331	40 22	307·543	+ ·200	3902·69	4	...	...	...	...	,,
245	Oct. 29	+22°·347	22 53 38	147·660	+0·059	1872·94	4	...	...	...	...	Tel. West.
246		+21°·321	23 2 25	472·446	+ ·155	5992·06	4	...	...	...	...	,,
247	Obs. Hall	,,	9 15	472·141	+ ·153	5988·26	4	...	...	...	...	,,
248		+22°·347	17 15	148·690	+ ·054	1885·94	4	...	...	...	...	,,
249		,,	24 9	149·036	+ ·053	1890·31	4	...	...	...	...	,,
250		+21°·321	31 30	471·080	+ ·146	5954·72	4	...	...	...	...	,,
251		,,	38 7	470·810	+ ·145	5971·28	4	...	...	...	...	,,
252		+22°·347	48 10	150·086	+ ·050	1903·59	4	...	...	...	...	,,
253	Oct. 29	+22°·347	5 23 25	165·422	+0·086	2098·49	4	...	...	...	..	Tel. East.
254		+21°·321	36 5	453·703	+ ·271	5755·99	4	...	...	...	...	,,
255	Obs. Hall	,,	43 11	453·384	+ ·284	5752·10	4	...	...	...	...	,,
256		+22°·347	53 14	166·772	+ ·104	2115·84	4	...	...	...	...	,,
257		,,	6 2 16	167·192	+ ·112	2121·27	4	...	...	...	...	,,
258		+21°·321	12 15	451·887	+ ·355	5734·03	4	...	...	...	...	,,
259		,,	19 9	451·588	+ ·378	5730·53	4	..	...	...	...	,,
260		+22°·347	30 6	168·398	+ ·141	2136·93	4	...	...	...	...	,,
261	Oct. 30	+20°·404	22 8 19	445·839	+0·407	5659·11	4	...	...	..	...	Tel. West.
262		+22°·331	12 32	298·670	+ ·236	3790·60	4	...	...	...	...	,,
263	Obs. Elkin	,,	15 41	298·672	+ ·229	3790·55	4	...	...	...	...	,,
264		+20°·404	19 38	445·081	+ ·367	5661·67	4	...	...	...	...	,,
265		,,	24 52	446·141	+ ·352	5662·24	5	...	...	...	...	,,
266		+22°·331	29 49	298·673	+ ·204	3790·24	4	...	...	...	...	,,
267		,,	32 44	298·638	+ ·200	3789·74	4	...	...	...	...	,,
268		+20°·404	37 3	446·323	+ ·318	5664·12	4	...	...	...	...	,,
269		,,	40 22	446·362	+ ·310	5664·51	4	...	...	...	...	,,
270		+22°·331	44 33	298·609	+ ·184	3789·17	4	...	...	...	...	,,
271		,,	46 57	298·604	+ ·181	3789·07	4	...	...	...	...	,,
272		+20°·404	50 38	446·530	+ ·287	5666·35	4	...	...	...	...	,,
273	Oct. 30	+21°·321	23 4 30	407·084	+0·139	5163·22	4	...	...	...	...	Tel. West.
274		+22°·347	12 46	211·934	+ ·076	2688·10	4	...	...	...	...	,,
275	Obs. Hall	,,	17 29	212·183	+ ·075	2691·24	4	...	...	...	...	,,
276		+21°·321	25 48	406·168	+ ·133	5151·54	4	...	...	...	...	,,
277		,,	32 50	405·804	+ ·131	5146·90	4	...	...	...	...	,,
278		+22°·347	39 19	213·160	+ ·071	2703·57	4	...	...	...	...	,,
279		,,	44 16	213·391	+ ·071	2706·50	4	...	...	...	...	,,
280		+21°·321	51 24	404·902	+ ·127	5135·39	4	...	...	...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
281	Oct. 30	+22°·347	5 26 6	229·414	+0·126	2910·34	4	...	...	...	...	Tel. East.
282		+21°·321	38 23	388·276·	+ ·245	4926·21	4	...	...	...	...	"
283	Obs. Hall	"	44 46	387·966	+ ·254	4922·30	4	...	...	...	...	"
284		+22°·347	52 38	230·613	+ ·151	2925·88	4	...	...	...	...	"
285		"	6 6 47	231·262·	+ ·169	2934·36	4	...	...	...	...	"
286		+21°·321	14 42	386·480·	+ ·321	4904·32	4	...	...	...	...	"
287		"	20 59	386·168·	+ ·339	4900·59	4	...	...	...	...	"
288		+22°·347	30 45	232·330·	+ ·209	2948·39	4	...	...	...	...	"
289	Oct. 31	+22°·329	21 57 29	343·815	+0·336	4364·39	4	...	...	...	...	Tel. West.
290		+20°·404	22 2 5	466·829·	+ ·445	5925·79	4	...	...	...	...	"
291	Obs. Elkin	"	5 43	466·964·	+ ·429	5927·30	4	...	...	...	...	"
292		+22°·329	9 27	343·669	+ ·299	4362·06	4	...	...	...	...	"
293		"	12 47	343·624·	+ ·290	4361·39	4	...	...	...	...	"
294		+20°·404	16 2	467·165·	+ ·390	5929·34	4	...	...	...	...	"
295		"	19 48	467·287·	+ ·377	5930·73	4	...	...	...	...	"
296		+22°·329	23 31	343·483	+ ·264	4359·26	4	...	...	...	...	"
297		"	25 59	343·401	+ ·258	4358·16	4	...	...	...	...	"
298		+20°·404	30 12	467·502	+ ·345	5933·06	4	...	...	...	...	"
299		"	33 46	467·580	+ ·335	5933·92	4	...	...	...	...	"
300		+22°·329	36 42	343·328	+ ·237	4356·95	4	...	...	...	...	"
301	Oct. 31	+22°·347	22 48 9	275·532·	+0·098	3494·74	4	...	...	...	...	Tel. West.
302		+21°·321	23 1 25	341·947	+ ·115	4337·04	4	...	...	...	...	"
303	Obs. Hall	"	6 32	341·716	+ ·113	4334·09	4	...	...	...	...	"
304		+22°·347	12 51	276·678	+ ·092	3509·20	4	...	...	...	...	"
305		"	19 32	276·988·	+ ·091	3513·11	4	...	...	...	...	"
306		+21°·321	27 3	340·696·	+ ·108	4321·10	4	...	...	...	...	"
307		"	31 14	340·542·	+ ·107	4319·12	4	...	...	...	...	"
308		+22°·347	38 18	277·846·	+ ·088	3523·94	4	...	...	...	...	"
309	Oct. 31	+21°·321	Some other stars were observed by mistake.									
309a		"										
310	Obs. Hall	+22°·347	6 18 50	296·742·	+ ·234	3765·39	4	...	...	...	...	Tel. East.
311		"	25 4	296·968	+ ·249	3768·45	4	...	...	...	...	"
312		+21°·321	35 37	320·203	+ ·313	4063·85	4	...	...	...	...	"
313	Nov. 1	+22°·329	22 9 20	330·365	+0·266	4192·93	4	...	...	...	...	Tel. West.
314		+20°·388	16 39	271·423	+ ·176	3444·31	4	...	...	...	...	"
315	Obs. Elkin	"	22 43	271·402	+ ·169	3443·97	5	...	...	...	...	"
316		+22°·329	29 49	330·293	+ ·224	4191·48	4	...	...	...	...	"
317		"	35 8	330·289	+ ·216	4191·33	4	...	...	...	...	"
318		+20°·388	39 43	271·174	+ ·151	3440·83	4	...	...	...	...	"
319		"	43 7	271·116	+ ·147	3440·06	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
320	Nov. 1	+22°·329	22 47 28	330·102	+0·197	4188·73	4	...	...	...	...	Tel. West.
321	(*continued*)	,,	51 38	330·129	+ ·192	4189·01	4	...	...	...	...	,,
322		+20°·388	56 40	270·951	+ ·137	3437·83	4	...	...	...	...	,,
323		,,	23 0 17	270·923	+ ·134	3437·44	4	...	...	...	...	,,
324		+22°·329	3 54	330·039	+ ·178	4187·68	4	...	...	...	...	,,
325	Nov. 1	+22°·347	23 19 40	342·411	+0·100	4342·86	4	...	...	...	...	Tel. West.
326		+21°·321	29 1	275·541	+ ·088	3494·73	4	...	...	...	...	,,
327	Obs. Hall	,,	35 27	275·219	+ ·087	3490·64	4	...	...	...	...	,,
328		+22°·347	44 34	343·583	+ ·106	4357·67	4	...	...	...	...	,,
329	Nov. 1	+21°·321	5 35 52	258·192	+0·152	3275·58	4	...	...	...	...	Tel. East.
330		+22°·347	47 24	360·754	+ ·224	4576·87	4	...	...	...	...	,,
331	Obs. Hall	,,	55 38	361·110	+ ·238	4581·57	4	...	...	...	...	,,
332		+21°·321	6 6 18	256·681	+ ·190	3256·89	4	...	...	...	...	,,
333		,,	15 59	256·210	+ ·207	3251·14	4	...	...	...	...	,,
334		+22°·347	25 46	362·490	+ ·307	4599·94	4	...	...	...	...	,,
335		,,	34 43	362·923	+ ·334	4605·77	4	...	...	...	...	,,
336		+21°·321	49 48	254·607	+ ·288	3231·83	4	...	...	...	...	,,
337	Nov. 2	+22°·329	21 44 46	330·529	+0·308	4195·55	4	...	...	...	...	Tel. West.
338		+20°·388	57 2	259·081	+ ·230	3288·48	4	...	...	...	...	,,
339	Obs. Elkin	,,	22 4 38	259·049	+ ·214	3287·88	4	...	...	...	...	,,
340		+22°·329	17 0	330·651	+ ·229	4196·09	4	...	...	...	...	,,
341		,,	23 14	330·722	+ ·218	4196·85	4	...	...	...	...	,,
342		+20°·388	31 47	259·110	+ ·171	3288·10	4	...	...	...	...	,,
343		,,	38 44	259·190	+ ·163	3289·01	4	...	...	...	...	,,
344		+22°·329	44 55	330·789	+ ·188	4197·32	4	...	...	...	...	,,
345	Nov. 3	+21°·317	21 52 39	269·797	+0·264	3424·81	4	...	...	...	...	Tel West.
346		+20°·388	56 24	262·497	+ ·255	3332·11	4	...	...	...	...	,,
347	Obs. Elkin	,,	58 37	262·569	+ ·250	3332·96	4	...	...	...	...	,,
348		+21°·317	22 1 48	269·699	+ ·241	3423·27	4	...	...	...	...	,,
349		,,	4 43	269·649	+ ·234	3422·56	4	...	...	...	...	,,
350		+20°·388	7 28	262·662	+ ·229	3333·88	4	...	...	...	...	,,
351		,,	9 47	262·697	+ ·224	3334·27	4	...	...	...	...	,,
352		+21°·317	13 8	269·571	+ ·216	3421·33	6	...	...	...	...	,,
353		,,	18 49	269·518	+ ·206	3420·54	4	...	...	...	...	,,
354		+20°·388	21 49	262·814	+ ·202	3335·46	4	...	...	...	...	,,
355		,,	24 4	262·863	+ ·198	3336·05	4	...	...	...	...	,,
356		+21°·317	26 50	269·495	+ ·193	3420·09	4	...	...	...	...	,,
357		,,	30 19	269·428	+ ·188	3419·16	4	...	...	...	...	,,
358		+20°·388	33 40	262·968	+ ·183	3337·17	4	...	...	...	...	,,
359		,,	35 43	262·985	+ ·181	3337·37	4	...	...	...	...	,,
360		+21°·317	39 2	269·388	+ ·176	3418·50	4	...	...	...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″ ″	° ′ ″		
361	Nov. 3	+22°·347	22 50 38	472·508	+0·157	5992·94	4	...	...	...	...	Tel. West.
362		+21°·321	23 2 6	150·196	+ ·058	1905·08	4	...	...	...	...	"
363	Obs. Hall	"	6 43	149·998	+ ·056	1902·55	4	...	...	...	...	"
364		+22°·347	13 50	473·574	+ ·150	6006·40	4	...	...	...	...	"
365		"	20 13	473·916	+ ·148	6010·70	4	...	...	...	...	"
366		+21°·321	28 18	149·062	+ ·051	1890·62	4	...	...	...	...	"
367		"	33 3	148·828	+ ·050	1887·64	4	...	...	...	...	"
368		+22°·347	41 16	474·888	+ ·144	6022·98	4	...	...	...	...	"
369	Nov. 3	+22°·347	5 46 35	492·180	+0·291	6244·09	4	...	...	...	...	Tel. East.
372		"	52 55	492·443	+ ·303	6247·59	4	...	...	...	...	"
373	Obs. Hall	"	6 19 4	493·600	+ ·369	6263·10	4	...	...	...	...	"
376		"	24 55	493·870	+ ·389	6266·77	4	...	...	...	...	"
370, 1,4,5		+21°·321	Some other star was observed by mistake.									
377	Nov. 7	+21°·304	21 52 35	384·748	+0·323	4883·32	4	...	...	...	...	Tel. West.
378		+19°·340	56 49	437·342	+ ·252	5549·40	4	...	...	...	...	"
379	Obs. Elkin	"	59 30	437·237	+ ·247	5548·01	4	...	...	...	...	"
380		+21°·304	22 3 29	384·852	+ ·291	4884·23	4	...	...	...	...	"
381		"	7 21	384·910	+ ·283	4884·86	4	...	...	...	...	"
382		+19°·340	10 48	436·940	+ ·229	5544·01	4	...	...	...	...	"
383		"	13 17	436·906	+ ·226	5543·54	4	...	...	...	...	"
384		+21°·304	16 28	385·000	+ ·263	4885·75	4	...	...	...	...	"
385		"	18 33	385·024	+ ·259	4886·00	4	...	...	...	...	"
386		+19°·340	21 35	436·657	+ ·216	5540·26	4	...	...	...	...	"
387		"	24 24	436·611	+ ·213	5539·64	4	...	...	...	...	"
388		+21°·304	27 58	385·119	+ ·241	4886·99	4	...	...	...	...	"
389		"	32 6	385·156	+ ·235	4887·37	4	...	...	...	...	"
390		+19°·340	34 38	436·334	+ ·203	5535·99	4	...	...	...	...	"
391		"	36 43	436·315	+ ·201	5535·72	4	...	...	...	...	"
392		+21°·304	40 19	385·236	+ ·222	4888·24	4	...	...	...	...	"
393	Nov. 7	+20°·338	22 52 58	400·289	+0·163	5077·38	4	...	...	...	...	Tel. West.
394		+20°·341	23 2 25	421·676	+ ·165	5348·58	4	...	...	...	...	"
395	Obs. Hall	"	6 55	421·518	+ ·163	5346·53	4	...	...	...	...	"
396		+20°·388	15 20	401·091	+ ·154	5087·42	4	...	...	...	...	"
397		"	22 24	401·334	+ ·151	5090·48	4	...	...	...	...	"
398		+20°·341	32 17	420·641	+ ·154	5335·31	4	...	...	...	...	"
399		"	38 40	420·351	+ ·152	5331·60	4	...	...	...	...	"
400		+20°·388	24 21 39	403·500	+ ·139	5117·78	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
401	Nov. 10	+20°·341	4 57 41	297·164	+0·096	3769·73	4	...	...	..	...	Tel. East.
402		+19°·340	5 2 17	345·522	+ ·099	4383·03	4	...	...	...	...	"
403	Obs. Elkin	"	4 54	345·476	+ ·099	4382·44	4	...	...	...	...	"
404		+20°·341	12 20	296·937	+ ·100	3766·90	4	...	...	...	...	"
405		"	15 24	296·845	+ ·101	3765·75	4	...	...	...	...	"
406		+19°·340	19 39	345·399	+ ·099	4381·47	4	...	...	...	...	"
407		"	22 42	345·330	+ ·099	4380·59	4	...	...	...	...	"
408		+20°·341	27 16	296·697	+ ·104	3763·91	4	...	...	...	...	"
409	Nov. 11	+20°·341	21 43 19	285·450	+0·300	3623·78	4	...	...	...	...	Tel. West.
410		+19°·340	46 42	337·403	+ ·350	4283·26	4	...	...	...	...	"
411	Obs. Elkin	"	53 29	337·462	+ ·326	4283·68	4	...	...	...	...	"
412		+20°·341	56 58	285·306	+ ·261	3621·45	4	...	...	...	...	"
413		"	59 54	285·283	+ ·254	3621·07	4	...	...	...	...	"
414		+19°·340	22 3 34	337·479	+ ·295	4283·51	4	...	...	...	...	"
415		"	5 39	337·437	+ ·290	4282·92	4	...	...	...	...	"
416		+20°·341	9 38	285·211	+ ·232	3619·89	5	...	...	...	...	"
417		"	12 1	285·217	+ ·226	3619·87	4	...	...	...	...	"
418		+19°·340	16 20	337·407	+ ·264	4282·21	4	...	...	...	...	"
419		"	18 48	337·426	+ ·258	4282·38	4	...	...	...	...	"
420		+20°·341	21 53	285·136	+ ·209	3618·64	4	...	...	...	...	"
421		"	24 23	285·107	+ ·205	3618·21	4	...	...	...	...	"
422		+19°·340	27 16	337·444	+ ·241	4282·40	4	...	...	...	...	"
423		"	29 11	337·430	+ ·236	4282·16	4	...	...	...	...	"
424		+20°·341	32 6	285·079	+ ·193	3617·72	4	...	...	...	...	"
425	Nov. 11	+20°·341	4 39 26	281·632	+0·084	3572·61	4	...	...	...	...	Tel. East.
426		+19°·340	43 23	336·785	+ ·098	4272·21	4	...	...	...	...	"
427	Obs. Elkin	"	46 16	336·783	+ ·098	4272·19	4	...	...	...	...	"
428		+20°·341	49 49	281·553	+ ·084	3571·62	4	...	...	..	...	"
429		"	52 51	281·546	+ ·085	3571·53	4	...	...	...	...	"
430		+19°·340	55 53	336·762	+ ·098	4271·92	4	...	...	...	...	"
431		"	57 57	336·762	+ ·098	4271·92	4	...	...	...	...	"
432		+20°·341	5 1 31	281·438	+ ·085	3570·16	4	...	...	...	...	"
433	Nov. 12	+20°·341	22 51 28	279·312	+0·165	3544·23	4	...	...	...	...	Tel. West.
434		+19°·340	23 1 5	335·940	+ ·197	4262·75	5	...	...	...	...	"
435	Obs. Elkin	"	6 12	335·969	+ ·190	4263·03	4	...	...	...	...	"
436		+20°·341	24 13	279·295	+ ·137	3543·64	4	...	...	...	...	"
437		"	29 3	279·279	+ ·134	3543·40	4	...	...	...	...	"
438		+19°·340	38 4	336·142	+ ·159	4264·85	4	...	...	...	...	"
439		"	53 21	336·227	+ ·148	4265·78	4	...	..	...	...	"
440		+20°·341	0 11 44	279·317	+ ·112	3543·61	4	...	..	...	...	"
441		"	17 0	279·319	+ ·110	3543·61	4	...	...	...	...	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
442	Nov. 12	+19°·340	0 19 47	336·350	+0·133	4267·14	4	...	...		...	...	Tel. West.
443	(*continued*)	,,	24 37	336·345·	+ ·131	4267·07	4	...	...		...	...	,,
444		+20°·341	27 59	279·290	+ ·106	3543·19	4	...	...		...	...	,,
445	Nov. 12	+20°·341	4 57 15	279·564·	+0·082	3546·36	4	...	...		...	...	Tel. East.
446		+19°·340	5 0 49	337·847·	+ ·103	4285·75	4	...	...		...	...	,,
447	Obs. Elkin	,,	3 5	337·888	+ ·103	4286·27	4	...	...		...	...	,,
448		+20°·341	6 56	279·612	+ ·082	3546·97	4	...	...		...	...	,,
449		,,	9 45	279·617·	+ ·082	3547·03	4	...	...		...	...	,,
450		+19°·340	12 52	337·949·	+ ·104	4287·05	4	...	...		...	...	,,
451		,,	15 16	337·958·	+ ·104	4287·17	4	...	...		...	...	,,
452		+20°·341	18 39	279·664·	+ ·083	3547·64	4	...	...		...	...	,,
453	Nov. 13	+20°·341	21 47 3	286·668	+0·273	3638·87	4	...	...		...	...	Tel. West.
454		+19°·340	51 14	343·082	+ ·358	4355·37	4	...	...		...	...	,,
455	Obs. Elkin	,,	54 22	343·141·	+ ·347	4355·98	4	...	...		...	...	,,
456		+20°·341	58 10	286·767	+ ·245	3639·77	4	...	...		...	...	,,
457		,,	22 1 48	286·799·	+ ·237	3640·08	4	...	...		...	...	,,
458		+19°·340	5 4	343·270·	+ ·312	4357·17	4	...	...		...	...	,,
459		,,	7 6	343·303	+ ·306	4357·51	4	...	...		...	...	,,
460		+20°·341	10 22	286·886	+ ·221	3640·98	4	...	...		...	...	,,
461		,,	13 7	286·901	+ ·216	3641·10	4	...	...		...	...	,,
462		+19°·340	16 22	343·421·	+ ·281	4358·70	4	...	...		...	...	,,
463		,,	18 34	343·436	+ ·277	4358·83	4	...	...		...	...	,,
464		+20°·341	21 18	287·073	+ ·202	3643·11	4	...	...		...	...	,,
465	Nov. 13	+19°·340	22 32 38	343·686	+0·247	4360·76	4	...	...		...	...	Tel. West.
466		+19°·324	42 56	494·115·	+ ·256	6268·20	4	...	...		...	...	,,
467	Obs. Hall	,,	49 4	493·916	+ ·247	6265·54	4	...	...		...	...	,,
468		+19°·340	56 6	343·964·	+ ·209	4363·80	4	...	...		...	...	,,
469		,,	23 4 26	344·072	+ ·198	4365·03	4	...	...		...	...	,,
470		+19°·324	10 45	493·324	+ ·219	6257·70	4	...	...		...	...	,,
471		,,	16 21	493·165·	+ ·213	6255·60	4	...	...		...	...	,,
472		+19°·340	23 31	344·268·	+ ·177	4367·26	4	...	...		...	...	,,
473	Nov. 13	+19°·324	5 22 16	482·829·	+0·231	6124·77	4	...	...		...	...	Tel. East.
474		+19°·340	27 26	348·553·	+ ·122	4420·90	4	...	...		...	...	,,
475	Obs. Hall	,,	41 16	348·624·	+ ·125	4421·84	4	...	...		...	...	,,
476		+19°·324	55 1	482·008	+ ·283	6115·02	4	...	...		...	...	,,
477		,,	6 5 34	481·634·	+ ·305	6110·55	4	...	...		...	...	,,
478		+19°·340	20 30	349·025	+ ·145	4427·16	4	...	...		...	...	,,
479		,,	28 20	349·146	+ ·149	4428·75	4	...	...		...	...	,,
480		+19°·324	42 40	480·554	+ ·424	6098·37	4	...	...		...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos. Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″ ″	° ′ ″		
481	Nov. 14	+20°·341	21 43 10	305·968	+0·262	3883·49	4	...	...	...	...	Tel. West.
482		+18°·283	47 6	223·326	+ ·164	2834·21	4	...	...	...	...	,,
483	Obs. Elkin	,,	49 33	223·275·	+ ·160	2833·52	4	...	...	...	...	,,
484		+20°·341	53 4	306·110	+ ·239	3885·00	4	...	...	...	...	,,
485		,,	56 41	306·221·	+ ·231	3886·31	4	...	...	...	...	,,
486		+18°·283	22 0 13	223·042	+ ·147	2830·39	4	...	...	...	...	,,
487		,,	2 32	222·945·	+ ·145	2829·14	4	...	...	...	...	,,
488		+20°·341	6 18	306·406·	+ ·214	3888·43	4	...	...	...	...	,,
489		,,	9 22	306·430·	+ ·208	3888·67	4	...	...	...	...	,,
490		+18°·283	12 14	222·779	+ ·134	2826·89	4	...	...	...	...	,,
491		,,	16 11	222·689	+ ·131	2825·71	4	...	...	...	...	,,
492		+20°·341	19 31	306·596	+ ·193	3890·57	4	...	...	...	...	,,
493		,,	22 27	306·676	+ ·190	3891·55	4	...	...	...	...	,,
494		+18°·283	25 35	222·542	+ ·123	2823·75	4	...	...	...	...	,,
495		,,	27 54	222·483	+ ·122	2822·99	4	...	...	...	...	,,
496		+20°·341	31 43	306·845	+ ·178	3893·54	4	...	...	...	...	,,
497	Nov. 14	+19°·324	22 43 29	458·991	+0·245	5822·69	4	...	...	...	...	Tel. West.
498		+19°·340	52 57	360·039	+ ·210	4567·63	4	...	...	...	...	,,
499	Obs. Hall	,,	59 21	360·133·	+ ·202	4568·71	4	...	...	...	...	,,
500		+19°·324	23 7 15	458·452·	+ ·212	5815·45	4	...	...	...	...	,,
501		,,	12 57	458·340·	+ ·206	5813·95	4	...	...	...	...	,,
502		+19°·340	19 0	360·487·	+ ·178	4572·92	4	...	...	...	...	,,
503		,,	22 53	360·511	+ ·174	4573·16	4	...	...	...	...	,,
504		+19°·324	29 32	457·890	+ ·190	5808·04	4	...	...	...	...	,,
505	Nov. 16	+19°·340	5 31 48	419·211	+0·203	5317·79	4	...	...	...	...	Tel. East.
506		+19°·324	40 44	404·033	+ ·161	5124·83	4	...	...	...	...	,,
507	Obs. Hall	,,	46 22	403·951·	+ ·165	5123·82	4	...	...	...	...	,,
508		+19°·340	53 53	419·671	+ ·232	5324·01	4	...	...	...	...	,,
509		,,	6 6 16	419·945	+ ·254	5327·75	4	...	...	...	...	,,
510		+19°·324	15 55	403·592	+ ·189	5119·58	4	...	...	...	...	,,
511		,,	20 56	403·553	+ ·194	5119·14	4	...	...	...	...	,,
512		+19°·340	28 33	420·393	+ ·306	5334·09	4	...	...	...	...	,,
513	Nov. 17	+19°·329	21 42 24	168·385·	+0·184	2137·72	4	...	...	...	...	Tel. West.
514		+18°·283	45 33	179·598·	+ ·198	2280·09	4	...	...	...	...	,,
515	Obs. Elkin	,,	48 13	179·609	+ ·191	2280·15	4	...	...	...	...	,,
516		+19°·329	51 58	168·452	+ ·167	2138·36	4	...	...	...	...	,,
517		,,	54 26	168·453	+ ·163	2138·32	4	...	...	...	...	,,
518		+18°·283	57 40	179·700·	+ ·174	2281·09	4	...	...	...	...	,,
519		,,	59 51	179·717	+ ·170	2281·27	4	...	...	...	...	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s		r	"		° ′ ″	″	″	° ′ ″		
520	Nov. 17	+19°·329	22 3 14	168·472·	+0·149	2138·40	4	...	...		...	...	Tel. West.
521	(*continued*)	,,	5 58	168·475	+ ·146	2138·38	4	...	...		...	...	,,
522		+18°·283	9 11	179·783·	+ ·156	2281·91	4	...	...		...	...	,,
523		,,	11 15	179·777	+ ·153	2281·79	4	...	...		...	...	,,
524		+19°·329	14 40	168·539·	+ ·135	2139·07	4	...	...		...	...	,,
525		,,	18 47	168·517·	+ ·131	2138·73	4	..	...		...	...	,,
526		+18°·283	22 21	179·894	+ ·139	2283·11	4	...	...		...	...	,,
527		,,	24 42	179·877·	+ ·136	2282·86	4	...	...		...	...	,,
528		+19°·329	27 58	168·580·	+ ·121	2139·41	4	...	...		...	...	,,
529	Nov. 17	+19°·340	22 41 25	440·477·	+0·238	5587·87	4	...	...		...	...	Tel. West.
530		+19°·324	49 39	396·361	+ ·240	5028·55	4	...	...		...	...	,,
531	Obs. Hall	,,	54 25	396·382·	+ ·232	5028·72	4	...	...		...	...	,,
532		+19°·340	23 2 31	440·984·	+ ·210	5593·96	4	...	...		...	...	,,
533		,,	10 54	441·248·	+ ·201	5597·18	4	...	...		...	...	,,
534		+19°·324	16 54	396·144	+ ·202	5025·31	4	...	...		...	...	,,
535		,,	20 17	396·166	+ ·199	5025·54	4	...	...		...	...	,,
536		+19°·340	26 11	441·618	+ ·186	5601·67	4	...	...		...	...	,,
537	Nov. 17	+19°·324	5 17 31	393·649	+0·136	4992·84	4	...	..		...	...	Tel. East.
538		+19°·340	24 44	450·380·	+ ·233	5713·37	4	...	...		...	...	,,
539	Obs. Hall	,,	29 38	450·492	+ ·239	5714·87	4	...	...		...	...	,,
540		+19°·324	37 9	393·513	+ ·143	4991·20	4	...	...		...	...	,,
541		,,	44 31	393·521	+ ·145	4991·33	4	...	...		...	...	,,
542		+19°·340	52 14	451·058·	+ ·278	5722·54	4	...	...		...	...	,,
543		,,	57 40	451·160	+ ·289	5723·97	4	...	...		...	...	,,
544		+19°·324	6 5 42	393·343·	+ ·155	4989·20	4	...	...		...	...	,,
545	Nov. 20	Standards	21 43 48	513·710·	+0·577	6521·98	4	...	...		...	...	Tel West.
546		,,	42 54	...	...	...	...	225 58 53	−167	+ 9	225 56 15	4	,,
547	Obs. Elkin	+18°·277	54 40	26·691	+ ·020	338·75	4	...	...		...	...	,,
548		,,	54 35	...	...	...	...	182 10 0	−158	+ 92	182 8 52	4	,,
549		,,	22 2 55	26·853·	+ ·019	340·78	4	...	...		...	...	,,
550		,,	2 53	...	...	...	...	1 39 0	−155	+ 83	1 37 47	4	,,
551		,,	8 55	26·940	+ ·018	341·87	4	...	...		...	...	,,
552		,,	8 49	...	...	...	...	1 16 30	−153	+ 78	1 15 14	4	,,
553		,,	16 12	27·143·	+ ·017	344·43	4	...	...		...	...	,,
554		,,	16 36	...	...	...	...	180 59 45	−149	+ 72	180 58 27	4	,,
555		,,	22 0	27·230·	+ ·016	345·53	4	...	...		...	...	,,
556		,,	22 4	...	...	...	...	180 34 30	−147	+ 67	180 33 10	4	,,
557		,,	29 13	27·347	+ ·015	346·99	4	...	...		...	...	,,
558		,,	29 20	...	...	...	...	180 11 15	−143	+ 62	0 9 54	4	,,
559		Standards	38 22	513·930	+ ·353	6521·93	4	...	...		...	...	,,
560		,,	37 54	...	...	...	...	45 58 15	−141	+ 9	45 56 3	4	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″	″	° ′ ″		
561	Nov. 20	+18°·277	5 6 44	37·016·	+0·020	469·69	4	...	...		...	...	Tel. East.
562		,,	6 40	...	...	...	...	162 39 30	+ 45	−35	162 39 40	4	,,
563	Obs. Elkin	,,	14 4	37·232·	+ ·021	472·44	4	...	...		...	...	,,
564		,,	14 4	...	...	...	...	342 27 15	+ 47	−38	342 27 23	4	,,
565		Standards	23 57	514·116	+ ·157	6521·82	4	...	...		...	...	,,
566		,,	23 39	...	...	...	...	45 55 32	+ 47	−24	45 55 55	4	,,
567		+18°·277	37 57	37·892·	+ ·026	480·86	4	...	...		...	...	,,
568		,,	37 55	...	...	...	...	341 40 45	+ 48	−46	341 40 46	4	,,
569		,,	45 12	38·070·	+ ·027	483·14	4	...	...		...	...	,,
570		,,	45 14	...	...	...	...	161 27 30	+ 49	−49	161 27 29	4	,,
571	Nov. 21	Standards	21 40 27	513·648	+0·602	6521·52	4	...	...		...	...	Tel. West.
572		,,	40 6	...	...	...	...	225 59 8	−167	+ 2	245 56 23	4	,,
573	Obs. Elkin	+18°·277	50 49	64·627·	+ ·023	819·86	4	...	...		...	...	,,
574		,,	50 52	...	...	...	...	143 5 22	−160	+64	143 3 46	4	,,
575		,,	59 6	64·868·	+ ·022	822·92	4	...	...		...	...	,,
576		,,	59 9	...	...	...	...	323 2 44	−157	+58	323 1 6	4	,,
577		,,	22 5 52	65·108	+ ·022	825·95	4	...	...		...	...	,,
578		,,	6 1	...	...	...	...	323 0 37	−154	+53	322 58 56	4	,,
579		,,	13 17	65·303·	+ ·022	828·42	4	...	...		...	...	,,
580		,,	13 20	...	...	...	...	142 53 30	−151	+49	142 51 48	4	,,
581		Standards	22 36	513·870·	+ ·402	6521·80	4	...	...		...	...	,,
582		,,	22 27	...	...	...	...	45 58 37	−148	+ 8	45 56 17	4	,,
583	Nov. 21	+18°·277	5 5 30	78·350	+0·046	994·19	4	...	...		...	...	Tel. East.
584		,,	5 21	...	...	...	...	319 39 3	+ 45	−15	319 39 33	4	,,
585	Obs. Elkin	,,	13 47	78·622	+ ·049	997·67	4	...	...		...	...	,,
586		,,	13 34	...	...	...	...	139 34 41	+ 46	−16	139 35 11	4	,,
587		Standards	23 30	514·108	+ ·158	6521·71	4	...	...		...	...	,,
588		,,	23 3	...	...	...	...	225 55 40	+ 47	−24	225 56 2	4	,,
589		+18°·277	35 12	79·289	+ ·058	1006·25	4	...	...		...	...	,,
590		,,	35 7	...	...	...	...	139 26 18	+ 48	−16	139 26 50	4	,,
591		,,	42 25	79·513	+ ·061	1009·13	4	...	...		...	...	,,
592		,,	42 20	...	...	...	...	319 20 44	+ 49	−16	319 21 17	4	,,
593	Nov. 22	Standards	21 38 45	513·672·	+0·610	6521·92	4	...	...		...	...	Tel. West.
594		,,	38 42	...	...	...	...	45 58 47	−168	+ 2	45 56 1	4	,,
595	Obs. Elkin	+18°·277	48 37	107·861·	+ ·033	1368·27	4	...	...		...	...	,,
596		,,	48 47	...	...	...	...	313 41 41	−161	+40	313 39 40	4	,,
597		,,	54 40	108·071	+ ·033	1370·93	4	...	...		...	...	,,
598		,,	54 35	...	...	...	...	133 38 37	−159	+38	133 36 36	4	,,
599		,,	22 0 58	108·261·	+ ·033	1373·34	4	...	...		...	...	,,
600		,,	1 5	...	...	...	...	133 34 33	−156	+35	133 32 32	4	,,
601		,,	8 40	108·506·	+ ·033	1376·45	4	...	...		...	...	,,

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No.	Date. 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
602	Nov. 22	+18°·277	22 8 43	...	...	...	...	313 36 33	−152	+32	313 34 33	4	Tel. West.
603	(*continued*)	,,	13 3	108·640	+0·033	1378·15	4	...	...		...	...	,,
604		,,	13 6	...	...	...	...	313 36 7	−150	+30	313 34 7	4	,,
605		,,	20 15	108·901·	+ ·033	1381·46	4	...	...		...	...	,,
606		,,	20 20	...	...	...	...	133 32 37	−147	+28	133 30 38	4	,,
607		Standards	29 42	513·907·	+ ·377	6521·95	4	...	...		...	...	,,
608		,,	29 51	...	...	...	...	225 58 14	−144	+ 8	225 55 58	4	,,
609	Nov. 22	+18°·277	5 2 14	121·393	+0·071	1540·36	4	...	...		...	...	Tel. West.
610		,,	2 16	...	...	...	...	132 19 56	+ 45	− 7	132 20 34	4	,,
611	Obs. Elkin	,,	10 18	121·666·	+ ·075	1543·87	4	...	...		...	...	,,
612		,,	10 18	...	...	...	...	312 19 22	+ 46	− 6	312 20 2	4	,,
613		Standards	20 0	514·139	+ ·159	6522·12	4	...	...		...	...	,,
614		,,	19 36	...	...	...	...	45 55 19	+ 46	−23	45 55 42	4	,,
615		+18°·277	31 41	122·330·	+ ·087	1552·44	4	...	...		...	...	,,
616		,,	31 44	...	...	...	...	312 15 22	+ 48	− 4	312 16 6	4	,,
617		,,	39 23	122·550·	+ ·092	1555·31	4	...	...		...	...	,,
618		,,	39 36	...	...	...	...	132 13 33	+ 48	− 3	132 14 19	4	,,
619	Nov. 23	+19°·324	22 50 44	469·151·	+0·266	5951·80	4	...	...		...	...	Tel. West.
620		+16°·247	59 47	526·784	+ ·247	6682·27	4	...	...		...	...	,,
621	Obs. Hall	,,	23 4 30	526·633	+ ·243	6680·30	4	...	...		...	...	,,
622		+19°·324	11 17	469·547·	+ ·241	5956·49	4	...	...		...	...	,,
623	Nov. 30	Standards	22 23 21	514·003·	+0·385	6521·98	4	...	...		...	...	Tel. West.
624		,,	22 0	...	...	...	...	225 58 45	−148	+ 7	225 56 24	4	,,
625	Obs. Hall	+17°·315	49 7	55·392	+ ·019	702·56	4	...	...		...	...	,,
626		,,	49 16	...	...	...	...	286 20 34	−133	−12	286 18 9	4	,,
627		,,	23 3 50	55·038·	+ ·018	698·07	4	...	...		...	...	,,
628		,,	4 6	...	...	...	...	106 23 52	−126	−10	106 21 36	4	,,
629		,,	17 50	54·758·	+ ·018	694·51	4	...	...		...	...	,,
630		,,	18 48	...	...	...	...	106 24 34	−120	− 8	106 22 26	4	,,
631		,,	50 53	54·004·	+ ·018	684·95	4	...	...		...	...	,,
632		,,	53 53	...	...	...	...	286 32 22	−105	− 6	286 30 31	4	,,
633		Standards	0 16 48	514·237·	+ ·205	6522·66	4	...	...		...	...	,,
634		,,	16 1	...	...	...	...	45 57 32	− 96	+10	45 56 6	4	,,
635	Dec. 1	Standards	21 43 0	513·840	+0·567	6522·22	4	...	...		...	...	Tel. West.
636		,,	46 54	...	...	...	...	226 59 0	−164	+ 3	225 56 19	4	,,
637	Obs. Hall	+17°·315	22 24 25	26·336	+ ·008	334·02	4	...	...		...	...	,,
638		,,	24 4	...	...	...	...	123 16 0	−145	+ 6	123 13 41	4	,,
639		,,	35 51	26·094	+ ·008	330·95	4	...	...		...	...	,,
640		,,	36 46	...	...	...	...	123 34 45	−139	+ 6	123 32 32	4	,,

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″	″	° ′ ″		
641	Dec. 1	+17°·315	22 48 31	25·846	+0·008	327·80	4	...	...		...	...	Tel. West.
642	(*continued*)	"	48 23	...	...	...	...	123 43 30	−133	+ 5	123 41 22	4	"
643		"	57 1	25·709	+ ·008	326·07	3	...	...		...	...	"
644		"	57 42	...	...	...	...	124 5 22	−129	+ 4	124 3 17	4	"
645		Standards	23 27 51	514·144	+ ·256	6522·13	4	...	...		...	...	"
646		"	27 40	...	...	...	...	225 58 14	−118	+10	225 56 26	4	"
647	Dec. 1	+17°·315	5 46 46	18·480	+0·015	234·50	4	...	...		...	...	Tel. East.
648		"	47 32	...	...	...	...	137 38 30	+ 48	−12	137 39 6	4	"
649	Obs. Hall	"	57 12	18·272·	+ ·016	231·89	4	...	...		...	...	"
650		"	58 19	...	...	...	...	138 16 15	+ 49	−12	138 16 52	4	"
651		Standards	6 20 12	514·264·	+ ·158	6522·41	4	...	...		...	...	"
652		"	19 0	...	...	...	...	225 55 39	+ 50	−44	225 55 45	4	"
653		+17°·315	41 25	17·623·	+ ·026	223·77	4	...	...		...	...	"
654		"	41 13	...	...	...	...	320 27 37	+ 49	−19	320 28 7	4	"
655		"	55 57	17·403	+ ·031	221·05	4	...	...		...	...	"
656		"	56 16	...	...	...	...	321 20 22	+ 49	−24	321 20 47	4	"
657	Dec. 2	Standards	22 13 42	514·009	+0·426	6522·57	4	...	...		...	...	Tel. West.
658		"	13 25	...	...	...	...	226 59 3	−153	+ 7	225 56 36	4	"
659	Obs. Hall	+17°·315	27 38	17·982	+ ·013	228·16	4	...	...		...	...	"
660		"	27 29	...	...	...	...	209 3 22	−143	+33	209 1 32	4	"
661		"	38 42	18·088·	+ ·012	229·50	4	...	...		...	...	"
662		"	38 20	...	...	...	...	209 39 15	−138	+29	209 37 26	4	"
663		"	50 5	18·258·	+ ·011	231·65	4	...	...		...	...	"
664		"	50 12	...	...	...	...	30 22 7	−132	+26	30 20 21	4	"
665		"	58 57	18·311·	+ ·011	232·31	4	...	...		...	...	"
666		"	59 10	...	...	...	...	30 51 7	−128	+23	30 49 22	4	"
667		Standards	23 10 54	514·124·	+ ·280	6522·19	4	...	...		...	...	"
668		"	10 25	...	...	...	...	45 57 49	−125	+10	45 55 54	4	"
669	Dec. 2	+17°·315	5 29 39	23·556	+0·007	298·76	4	...	...		...	...	Tel. East.
670		"	28 39	...	...	...	...	228 3 56	+ 48	−18	228 4 26	...	"
671	Obs. Hall	"	42 50	23·771·	+ ·007	301·48	4	...	...		...	...	"
672		"	42 55	...	...	...	...	228 32 26	+ 49	−21	228 32 54	...	"
673		Standards	58 51	514·264	+ ·156	6522·38	4	...	...		...	...	"
674		"	57 51	...	...	...	...	225 55 48	+ 50	−34	225 56 3	4	
675		+17°·315	6 18 56	24·452·	+ ·007	310·12	4	...	...		...	...	"
676		"	19 7	...	...	...	...	229 40 7	+ 49	−28	229 40 28	4	"
677		"	30 38	24·587·	+ ·007	311·83	4	...	...		...	...	"
678		"	30 2	...	...	...	...	229 52 52	+ 49	−30	229 53 11	4	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	″		° ′ ″	″	″	° ′ ″		
679	Dec. 4	Standards	21 52 39	513·916·	+0·511	6522·48	4	...	...		...	...	Tel. West.
680		"	51 24	...	...	...	...	45 58 46	−162	+ 4	45 56 9	4	"
681	Obs. Hall	+17°·315	22 10 59	71·489	+ ·051	907·07	4	...	...		...	...	"
682		"	11 21	...	...	...	...	68 46 19	−150	−34	68 43 15	4	"
683		"	22 33	71·766·	+ ·047	910·54	4	...	...		...	...	"
684		"	22 58	...	...	...	...	68 49 0	−146	−27	68 46 7	4	"
685		"	37 39	72·049·	+ ·043	914·07	4	...	...		...	...	"
686		"	38 0	...	...	...	...	68 51 11	−138	−21	68 48 32	4	"
687		"	48 55	72·230·	+ ·040	916·33	4	...	...		...	...	"
688		"	49 21	...	...	...	...	68 53 15	−133	−17	68 50 45	4	"
689	Dec. 6	+16°·247	22 5 23	123·099	+0·105	1562·42	4	...	...		...	...	Tel. West.
690		"	5 50	...	...	...	...	239 9 52	−154	−24	239 6 53	4	"
691	Obs. Elkin	"	15 16	122·911·	+ ·097	1559·95	4	...	...		...	...	"
692		"	15 28	...	...	...	...	59 8 30	−149	−19	59 5 41	4	"
693		Standards	23 54	513·914·	+ ·389	6522·20	3	...	...		...	...	"
694		"	23 42	...	...	...	...	45 58 6	−147	+ 8	45 55 45	*3	"
695		+16°·247	35 27	122·528·	+ ·083	1554·92	4	...	...		...	...	"
696		"	35 4	...	...	...	...	59 6 18	−141	−12	59 3 44	4	"
697		"	44 20	122·393	+ ·078	1553·13	4	...	...		...	...	"
698		"	44 28	...	...	...	...	239 5 56	−136	−10	239 3 29	4	"
								* One pointing rejected.					
699	Dec. 6	+16°·247	5 19 35	114·926·	+0·035	1457·89	4	...	...		...	...	Tel. East.
700		"	19 30	...	...	...	...	238 26 18	+ 47	− 2	238 27 3	4	"
701	Obs. Elkin	"	26 27	114·777·	+ ·035	1456·00	4	...	...		...	...	"
702		"	26 39	...	...	...	...	58 25 33	+ 48	− 2	58 26 19	4	"
703		Standards	35 15	514·192	+ ·155	6522·74	4	...	...		...	...	"
704		"	35 9	...	...	...	...	45 55 57	+ 48	−27	45 56 17	4	"
705		+16°·247	45 36	114·421	+ ·035	1451·48	4	...	...		...	...	"
706		"	45 46	...	...	...	...	58 23 46	+ 48	− 3	58 24 31	4	"
707		"	52 36	114·294·	+ ·035	1449·87	4	...	...		...	...	"
708		"	52 56	...	...	...	...	238 24 3	+ 49	− 3	238 24 49	4	"
709	Dec. 12	Standards	22 51 16	514·111	+0·320	6522·52	4	...	...		...	...	Tel. West.
710		"	50 55	...	...	...	...	45 58 8	−135	+ 9	45 56 2	4	"
711	Obs. Hall	+16°·247	23 29 5	67·043	+ ·034	850·48	4	...	...		...	...	"
712		"	29 19	...	...	...	...	206 56 56	−117	+23	206 55 22	4	"
713		"	40 29	67·250·	+ ·032	853·07	4	...	...		...	...	"
714		"	41 0	...	...	...	...	207 0 45	−112	+22	206 59 15	4	"
715		"	53 53	67·543	+ ·030	856·76	4	...	...		...	...	"
716		"	54 1	...	...	...	...	207 2 15	−105	+20	207 0 50	4	"
717		"	24 3 12	67·783	+ ·028	859·78	4	...	...		...	...	"
718		"	3 36	...	...	...	...	207 5 26	−101	+19	207 4 4	4	"

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No.	Date, 1888.	Objects.	Sidereal Time.	Measured Distance.	Correction for Refr.	Reduced Distance.	Bis.	Measured Angle.	Correction for Pos.	Correction for Refr.	Reduced Angle.	Bis.	Notes.
			h m s	r	r	"		° ′ ″	″	″	° ′ ″		
719	Dec. 12	+16°·247	5 35 31	74·951	+0·027	950·65	4	...	...		...	...	Tel. East.
720		"	36 6	...	...	...	...	208 2 0	+ 48	− 49	208 1 59	4	"
721	Obs. Hall	"	55 2	75·439	+ ·014	956·69	4	...	...		...	...	"
722		"	55 2	...	...	...	...	208 3 52	+ 48	− 61	208 3 39	4	"
723		Standards	33 12	514·236·	+ ·159	6522·06	4	...	...		...	...	"
724		"	37 7	...	...	...	...	45 56 7	+ 50	− 53	45 56 4	4	"
725	Dec. 13	Standards	22 26 24	514·056·	+0·388	6522·70	4	...	...		...	...	Tel. West.
726		"	25 55	...	...	...	...	45 58 22	−146	+ 8	45 56 3	4	"
727	Obs. Hall	+16°·247	41 49	100·255	+ ·070	1272·03	4	...	...		...	...	"
728		"	41 59	...	...	...	...	28 49 0	−138	+ 31	28 47 13	4	"
729		"	52 46	100·510	+ ·064	1275·19	4	...	...		...	...	"
730		"	52 57	...	...	...	...	28 49 34	−133	+ 29	28 47 50	4	"
731		"	23 2 52	100·710·	+ ·061	1277·69	4	...	...		...	...	"
732		"	3 2	..	...	...	...	28 49 45	−128	+ 26	28 48 3	4	"
733		"	12 58	100·960	+ ·057	1280·80	4	...	...		...	...	"
734		"	12 49	...	...	...	...	28 50 37	−123	+ 24	28 48 58	4	"
735	Dec. 13	+16°·247	5 27 43	109·500	+0·039	1388·86	4	...	...		...	...	Tel. East.
736		"	28 3	...	...	...	...	29 7 37	+48	− 37	29 7 48	4	"
737	Obs. Hall	"	53 49	110·125	+ ·042	1396·83	4	...	...		...	...	"
738		"	53 42	...	...	...	...	29 7 45	+49	− 60	29 7 34	4	"
739		"	6 10 20	110·506	+ ·045	1401·70	4	...	...		...	...	"
740		"	5 1	...	...	...	...	29 10 15	+49	− 70	29 9 54	4	"
741		"	32 49	111·039	+ ·051	1408·52	4	...	...		...	...	"
742		"	35 18	...	...	...	...	29 12 52	+49	−105	29 11 56	4	"

8.—Formation of Equations of Condition.

The comparison of the values interpolated from the data in Section 6, with the observed quantities in Section 7 leads to the equations of condition on the following pages. These contain after the times of the heliometer observations expressed in fractions of a day, the computed results interpolated for these epochs and the equations of condition. These are formed for the following unknowns :—

s. The error of the assumed scale-value per 10,000″.

p. The error of the assumed index error of the position circle, expressed as the deviation on a great circle for a distance of 10,000″.

π. The correction to the assumed mean solar parallax (8″·800) per 10″, or in tenth parts.

α. The correction to the relative R.A. of planet and star.

δ. The correction to the relative Declination of planet and star.

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For the position-angle equations, the values of the right-hand member of the equations, or the quantities "observed minus computed," are given both in seconds of angle and in seconds of arc of a great circle.

Equations of Condition for Cape Observations.

No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
2	Oct. 12·57113	+ 24·376 D.	755·95	+ 0·077 s	− 0·878 π	+ 0·276 α	− 0·953 δ	= ...
3	12·57583	,,	756·33	·076	·879	·272	·954	+ 0·47
		(The first measure was from the fainter component of + 24°·376.)						
					″			
1	Oct. 12·6	Stands. D.	6521·72	+ 0·652 s	= − 0·55			
6	Oct. 13·58164	+ 24·376 D.	998·80	+ 0·099 s	− 0·649 π	− 0·231 α	− 0·967 δ	= ...
7	13·58982	,, P.A.	194° 55′ 6″	·099 p	+ ·672	·883	+ ·257	= ...
		(These measures were from the fainter component of + 24°·376.)						
			″		″			
4	Oct. 13·6	Stands. D.	6521·73	+ 0·652 s	= − 0·62			
5	13·6	,, P.A.	135° 56′ 17″	·652 p	− 7	= − 0·22		
			″					″
8	Oct. 14·53349	+ 24·369 D.	2408·96	+ 0·241 s	− 0·838 π	+ 0·459 α	− 0·864 δ	= − 0·13
11	14·56605	,,	2407·76	·241	·893	·453	·869	+ 0·17
12	14·57264	,,	2407·56	·241	·900	·451	·869	− 0·23
15	14·59344	,,	2407·04	·241	·925	·447	·872	− 0·28
9	Oct. 14·54610	+ 22·375 D.	4486·51	+ 0·449 s	+ 0·874 π	− 0·297 α	+ 0·947 δ	= − 0·24
10	14·55565	,,	4485·75	·449	·883	·298	·946	− 0·40
13	14·58145	,,	4483·66	·448	·895	·302	·944	− 0·51
14	14·58584	,,	4483·30	·448	·897	·302	·944	− 0·68
16	Oct. 15·53145	+ 22·372 D.	4383·48	+ 0·438 s	+ 0·867 π	− 0·220 α	+ 0·971 δ	= − 0·13
19	15·58997	,,	4374·98	·437	·877	·227	·969	− 0·74
17	Oct. 15·57367	+ 24·358 D.	5396·00	+ 0·540 s	− 0·865 π	+ 0·654 α	− 0·664 δ	= + 0·08
18	15·58005	,,	5394·52	·539	·883	·684	·665	+ 0·48
20	Oct. 21·49783	+ 23·326 D.	4163·19	+ 0·416 s	− 0·792 π	+ 0·540 α	− 0·809 δ	= + 0·42
23	21·51648	,,	4161·68	·416	·839	·538	·810	− 0·30
24	21·52467	,,	4161·05	·416	·862	·538	·811	+ 0·09
27	21·54808	,,	4159·37	·416	·914	·533	·814	+ 0·33
28	21·55502	,,	4158·91	·416	·922	·532	·815	+ 0·50
31	21·58168	,,	4157·29	·416	·959	·529	·818	+ 0·19
21	Oct. 21·50493	+ 22·368 D.	3836·65	+ 0·384 s	+ 0·730 π	− 0·680 α	+ 0·672 δ	= − 0·46
22	21·51030	,,	3837·96	·384	·747	·681	·671	− 0·41
25	21·53256	,,	3843·34	·384	·810	·683	·669	− 0·42
26	21·53902	,,	3844·90	·384	·840	·684	·668	− 0·46
29	21·56413	,,	3850·96	·385	·905	·687	·664	− 0·47
30	21·57099	,,	3852·62	·385	·917	·688	·663	− 0·32

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
34	Oct. 22·51470	+ 22·354 P.A.	68 0 6	+ 0·109 p	− 0·886 π	+ 0·348 α	− 0·926 δ	= + 28	= + 0·15
35	22·52626	,,	68 4 22	·108	·897	·349	·925	+ 51	+ 0·27
37	22·55147	,,	68 14 7	·107	·920	·351	·924	+ 89	+ 0·46
38	22·56261	,,	68 18 38	·106	·925	·352	·923	+ 48	+ 0·25
			″		″				
32	Oct 22·5	Stands. D.	6521·83	+ 0·652 s	= + 0·29				
33	22·5	,, P.A.	135° 56′ 17″	·652 p	− 4	= − 0·13			
36	22·5	,, P.A.	,,	·652	+22	+ 0·70			
			″					″	
41	Oct. 24·51461	+ 22·354 D.	480·84	+ 0·048 s	− 0·545 π	− 0·503 α	− 0·839 δ	= − 0·04	
44	24·54811	,,	505·95	·051	·387	·519	·826	+ 0·53	
			° ′ ″					″	″
42	Oct. 24·52469	+ 22·354 P.A.	213 21 25	+ 0·049 p	+ 0·764 π	− 0·769 α	+ 0·550 δ	= +173	= + 0·41
43	24·53723	,,	213 51 31	·049	·809	·765	·557	− 92	− 0·22
45	24·55755	,,	214 37 33	·051	·876	·758	·567	+168	+ 0·42
46	24·56778	,,	214 59 26	·052	·905	·754	·571	+170	+ 0·43
			″		″				
39	Oct. 24·5	Stands. D.	6521·85	+ 0·652 s	= − 0·28	″			
40	24·5	,, P.A.	135° 56′ 17″	·652 p	+ 8	= + 0·25			
47	24·6	,, P.A.	,,	·652	−13	− 0·41			
			″					″	
48	Oct. 25·49222	+ 22·354 D.	1222·82	+ 0·122 s	− 0·418 π	− 0·680 α	−10·674 δ	= + 0·02	
51	25·51088	,,	1238·23	·124	·331	·682	·672	+ 0·06	
52	25·51752	,,	1243·71	·124	·302	·683	·671	+ 0·49	
55	25·53808	,,	1260·70	·126	·202	·684	·670	+ 0·11	
49	Oct. 25·49943	+ 22·347 D.	1606·21	+ 0·161 s	+ 0·538 π	+ 0·532 α	+ 0·817 δ	= − 0·32	
50	25·50410	,,	1602·58	·160	·522	·531	·817	− 0·15	
53	25·52513	,,	1586·34	·159	·454	·529	·819	− 0·29	
54	25·52995	,,	1582·62	·158	·437	·528	·820	− 0·54	
58	Oct. 26·50940	+ 22·347 D.	900·61	+ 0·090 s	+ 0·708 π	+ 0·260 α	+ 0·959 δ	= − 0·33	
59	26·51569	,,	896·58	·090	·699	·257	·960	− 0·24	
60	26·52333	,,	891·69	·089	·684	·252	·961	− 0·48	
61	26·52976	,,	887·59	·089	·671	·249	·963	− 0·38	″
62	26·53784	,, P.A.	15° 22′ 46″	·088 p	− 0·658	·889	− 0·266	=+50	= + 0·21
63	26·54958	,, P.A.	14° 56′ 43″	·088	·705	·892	·258	+26	+ 0·11
			″		″				
56	Oct. 26·5	Stands. D.	6521·88	+ 0·652 s	= − 0·30				
64	26·6	,, D.	,,	·652	− 0·06	″			
57	26·5	,, P.A.	135° 56′ 17″	·652 p	− 5	= − 0·16			
65	26·6	,, P.A.	,,	·652	+ 3	+ 0·10			
								″	
67	Oct. 27·51490	+ 22·347 D.	583·72	+ 0·058 s	+ 0·842 π	− 0·664 α	+ 0·699 δ	=+0·04	
68	27·54754	,,	590·44	·059	·913	·694	·660	+0·39	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
			″					
66	Oct. 27·5	Stands. D.	6521·89	+ 0·652 s	= − 0·62″			
		°						
69	Oct. 29·48910	+ 22·331 D.	3898·50	+ 0·390 s	− 0·749 π	+ 0·715 α	− 0·633 δ	− 0·17″
70	Oct. 29·50152	+ 20·404 D.	5514·78	+ 0·551 s	+ 0·839 π	− 0·623 α	+ 0·739 δ	− 0·35
71	Oct. 30·48139	+ 22·331 D.	3775·29	+ 0·377 s	− 0·815 π	+ 0·576 α	− 0·783 δ	− 0·31
74	30·50149	,,	3774·19	·377	·868	·573	·786	− 0·20
75	30·50806	,,	3773·86	·377	·891	·571	·787	− 0·40
78	30·53146	,,	3772·89	·377	·933	·568	·791	− 0·39
72	Oct. 30·48814	+ 20·404 D.	5669·91	+ 0·567 s	+ 0·760 π	− 0·717 α	+ 0·633 δ	− 0·74
73	30·49442	,,	5671·48	·567	·777	·717	·633	− 0·58
76	30·51538	,,	5676·66	·568	·841	·719	·630	+ 0·04
77	30·52283	,,	5678·50	·568	·856	·720	·629	− 0·65
79	Oct. 31·48481	+ 22·329 D.	4353·10	+ 0·435 s	− 0·719 π	+ 0·757 α	− 0·577 δ	= + 0·28
82	31·51511	,,	4344·56	·434	·827	·755	·581	+ 0·25
83	31·52558	,,	4341·93	·434	·859	·753	·583	+ 0·07
80	Oct. 31·49559	+ 20·404 D.	5938·41	+ 0·594 s	+ 0·720 π	− 0·792 α	+ 0·519 δ	= − 0·16
81	31·50477	,,	5941·68	·594	·757	·793	·518	− 0·22
84	31·55314	,,	5958·71	·596	·907	·794	·513	+ 1·58
85	Nov. 2·48517	+ 22·329 D.	4177·62	+ 0·418 s	− 0·873 π	+ 0·494 α	− 0·846 δ	= − 0·30
88	2·50634	,,	4179·16	·418	·911	·491	·848	− 0·06
89	2·51238	,,	4179·64	·418	·920	·491	·849	− 0·03
92	2·52618	,,	4180·76	·418	·941	·488	·851	− 0·41
86	Nov. 2·49257	+ 20·388 D.	3306·25	+ 0·331 s	+ 0·879 π	− 0·517 α	+ 0·831 δ	= − 0·23
87	2·49820	,,	3306·03	·331	·898	·519	·829	− 0·29
90	2·51744	,,	3305·27	·330	·927	·523	·826	− 0·41
91	2·52166	,,	3305·10	·331	·933	·524	·825	+ 0·19
93	Nov. 3·49857	+ 21·317 D.	3406·08	+ 0·341 s	− 0·843 π	+ 0·701 α	− 0·658 δ	= + 0·38
96	3·53341	,,	3400·14	·340	·929	·695	·666	+ 0·46
94	Nov. 3·51234	+ 20·388 D.	3352·42	+ 0·335 s	+ 0·873 π	− 0·699 α	+ 0·660 δ	= + 0·12
95	3·51864	,,	3353·52	·335	·899	·700	·658	+ 0·73
			° ′ ″					
97	Nov. 4·48095	+ 21·321 P.A.	90 45 42	+ 0·122 p	− 0·822 π	− 0·011 α	− 1·000 δ	= + 7″ = + 0·13″
99	4·51456	,,	91 38 47	·119	·777	·029	0·999	+51 + 0·93
98	Nov. 4·5	Stands. P.A.	135 56 17	+ 0·652 p	= − 2″	= − 0·06″		

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
101	Nov. 5·47568	+ 21·321 D.	802·19	+ 0·080 s	− 0·797 π	+ 0·679 α	− 0·685 δ	= − 0·57
102	5·47903	,,	801·76	·080	·815	·676	·689	− 0·66
103	5·48457	,,	801·10	·080	·831	·672	·693	− 0·79
104	5·48982	,,	800·50	·080	·848	·669	·697	− 0·41
105	5·49418	,,	800·03	·080	·863	·666	·701	− 0·61
106	5·49790	,,	799·64	·080	·868	·662	·703	− 0·42
107	5·50134	,,	799·29	·080	·878	·662	·705	− 0·30
108	5·50513	,,	798·94	·080	·892	·658	·708	− 0·72
109	5·51065	,,	798·43	·080	·905	·654	·712	− 0·42
110	5·51417	,,	798·14	·080	·917	·651	·716	− 0·62
					″			
100	Nov. 5·5	Stands. D.	6521·97	+ 0·652 s	= − 0·06			
111	5·5	,,	6521·98	·652	− 0·26			
112	Nov. 6·45786	+ 21·321 D.	1081·24	+ 0·108 s	− 0·822 π	− 0·030 α	− 0·999 δ	= − 0·09
113	6·46399	,,	1084·75	·108	·816	·034	·999	+ 0·11
114	6·47089	,,	1088·72	·109	·809	·038	·999	− 0·02
115	6·47687	,,	1092·18	·109	·803	·042	·999	− 0·03
					″			
116	Nov. 6·5	Stands. D.	6521·99	+ 0·652 s	= + 0·11			
117	6·5	,, D.	,,	·652	+ 0·17			
118	Nov. 7·46130	+ 21·304 D.	4862·85	+ 0·486 s	− 0·854 π	+ 0·457 α	− 0·873 δ	= − 0·01
121	7·47914	,,	4865·73	·487	·891	·454	·874	− 0·34
122	7·48602	,,	4866·88	·487	·899	·452	·875	− 0·31
125	7·50499	,,	4870·12	·487	·924	·450	·876	− 0·25
126	7·51292	,,	4871·50	·487	·930	·449	·877	+ 0·22
129	7·53100	,,	4874·74	·487	·947	·446	878	+ 0·10
119	Nov. 7·46758	+ 19·340 D.	5571·80	+ 0·557 s	+ 0·837 π	− 0·057 α	+ 0·999 δ	= − 0·63
120	7·46987	,,	5569·20	·557	·836	·057	·999	− 0·18
123	7·49143	,,	5559·59	·556	·827	·060	·998	− 0·57
124	7·49731	,,	5556·58	·556	·820	·061	·998	− 0·75
127	7·51940	,,	5545·25	·555	·803	·064	·998	− 0·47
128	7·52462	,,	5542·57	·554	·798	·065	·998	− 0·66
130	Nov. 9·44473	+ 21·304 D.	5463·66	+ 0·546 s	− 0·852 π	+ 0·205 α	− 0·975 δ	= − 0·26
133	9·48250	,,	5479·08	·548	·865	·200	·977	+ 0·05
134	9·48811	,,	5481·39	·548	·866	·199	·977	− 0·29
131	Nov. 9·45262	+ 19·340 D.	4728·74	+ 0·473 s	+ 0·859 π	− 0·303 α	+ 0·946 δ	= − 0·14
132	9·46708	,,	4724·12	·472	·877	·306	·945	− 0·67

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
135	Nov.10·46589	+ 20·341 D.	3860·37	+ 0·386 s	− 0·609 π	+ 0·876 α	− 0·353 δ	= − 0·87
138	10·49192	„	3850·75	·385	·713	·874	·358	− 0·81
139	10·49943	„	3848·02	·385	·751	·873	·360	− 1·01
142	10·52074	„	3840·38	·384	·787	·872	·363	− 1·18
136	Nov.10·47347	+ 19·340 D.	4450·68	+ 0·445 s	+ 0·886 π	− 0·447 α	+ 0·879 δ	= + 0·55
137	10·48159	„	4449·08	·445	·896	·448	·878	− 0·11
140	10·50754	„	4443·93	·444	·927	·452	·876	− 0·43
141	10·51324	„	4442·80	·444	·933	·453	·875	− 0·41
143	Nov.11·46276	+ 20·341 D.	3608·90	+ 0·361 s	− 0·710 π	+ 0·795 α	− 0·530 δ	= − 0·82
146	11·49620	„	3602·21	·360	·837	·798	·536	− 0·47
144	Nov.11·47101	+ 19·340 D.	4300·46	+ 0·430 s	+ 0·860 π	− 0·585 α	+ 0·781 δ	= − 0·32
145	11·47974	„	4299·89	·430	·882	·586	·780	− 0·02
147	Nov.12·45372	+ 20·341 D.	3528·62	+ 0·353 s	− 0·787 π	+ 0·673 α	− 0·697 δ	= − 0·41
150	12·47246	„	3528·27	·353	·846	·670	·700	− 0·62
151	12·47742	„	3528·20	·353	·855	·669	·701	− 0·41
154	12·49510	„	3528·00	·353	·900	·666	·704	− 0·45
155	12·50261	„	3527·95	·353	·911	·665	·705	− 0·28
148	Nov.12·46015	+ 19·340 D.	4275·35	+ 0·428 s	+ 0·789 π	− 0·705 α	+ 0·659 δ	= + 0·20
149	12·46569	„	4275·72	·428	·804	·706	·658	+ 0·25
152	12·48314	„	4276·89	·428	·855	·709	·656	+ 0·08
153	12·48807	„	4277·22	·428	·873	·709	·655	+ 0·10
156	12·50977	„	4278·64	·428	·921	·711	·652	+ 0·47
157	Nov.13·44560	+ 20·341 D.	3620·13	+ 0·362 s	− 0·827 π	+ 0·523 α	− 0·829 δ	= − 1·46
160	13·46793	„	3623·58	·362	·872	·521	·830	− 0·85
161	13·47395	„	3624·54	·362	·884	·519	·832	− 0·47
164	13·50003	„	3628·83	·363	·926	·516	·836	− 0·70
158	Nov.13·45541	+ 19·340 D.	4369·13	+ 0·437 s	+ 0·704 π	− 0·802 α	+ 0·519 δ	= + 0·30
159	13·46038	„	4370·06	·437	·723	·803	·518	+ 0·24
162	13·48417	„	4374·50	·437	·806	·804	·515	+ 0·31
163	13·49238	„	4376·02	·438	·831	·805	·514	+ 0·30
166	Nov.18·39346	+ 18·277 D.	1161·01	+ 0·116 s	+ 0·712 π	+ 0·321 α	+ 0·941 δ	= − 0·10
167	18·41724	„	1145·62	·115	·665	·316	·943	+ 0·21
			° ′ ″					″
168	Nov.18·46541	+ 18·277 P.A.	18 59 24	+ 0·111 p	− 0·672 π	+ 0·893 α	− 0·326 δ	= −16 = − 0·09
170	18·50727	„	18 29 24	·109	·809	·896	·318	−25 − 0·13
			″		″			
165	Nov.18·4	Stands. D.	6522·12	+ 0·652 s = − 0·45				
169	18·5	„ P.A.	135° 56′ 18″	·652 p	− 15	= − 0″·47		

No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	″					″	
171	Nov.19·45135	+ 18·277 D.	538·78	+ 0·054 s	+ 0·760 π	− 0·007 α	+ 1·000 δ	= + 0·06	
172	19·45676	„	535·94	·054	·758	·010	·000	+ 0·51	
173	19·46496	„	531·66	·053	·753	·016	·000	+ 0·17	
174	19·47357	„	527·18	·053	·748	·022	·000	+ 0·16	
			° ′ ″					″	″
176	Nov.19·48995	+ 18·277 P.A.	357 48 57	+ 0·052 p	− 0·536 π	+ 0·943 α	+ 0·038 δ	= − 179	= − 0·45
178	19·50857	„	356 56 55	·052	·598	·943	·054	− 264	− 0·66
			″		″				
175	Nov.19·5	Stands. D.	6522·13	+ 0·652 s	= − 0·37				
177	19·5	„ P.A.	135° 56′ 18″	·652 p	− 7	= − 0·22			
			″					″	
189	Nov.20·45886	+ 18·277 D.	353·77	+ 0·035 s	+ 0·490 π	− 0·943 α	+ 0·058 δ	= − 0·03	
190	20·46382	„	355·50	·036	·500	·943	·050	− 0·11	
191	20·47176	„	358·29	·036	·520	·944	·037	+ 0·01	
192	20·47679	„	360·09	·036	·535	·944	·030	+ 0·02	
193	20·48200	„	361·95	·036	·550	·944	·023	+ 0·10	
194	20·48546	„	363·20	·036	·564	·945	·015	− 0·06	
			° ′ ″					″	″
179	Nov.20·38275	+ 18·277 P.A.	100 14 1	+ 0·033 p	+ 0·759 π	+ 0·173 α	+ 0·983 δ	= + 133	= + 0·21
180	20·38883	„	99 37 43	·033	·751	·155	·986	− 134	− 0·21
181	29·39507	„	99 0 52	·033	·748	·148	·987	+ 236	+ 0·38
182	20·40089	„	98 26 50	·033	·745	·140	·989	+ 228	+ 0·36
184	20·41972	„	96 39 1	·034	·734	·109	·994	+ 264	+ 0·43
185	20·42553	„	96 6 26	·034	·732	·101	·995	+ 238	+ 0·39
186	20·43211	„	95 29 57	·034	·730	·093	·996	+ 68	+ 0·11
187	20·43749	„	95 0 26	·034	·727	·083	·997	+ 71	+ 0·12
			″		″				
188	Nov.20·4	Stands. D.	6522·14	+ 0·652 s	= − 0·09				
195	20·5	„ D.	„	·652	+ 0·50	″			
183	20·4	„ P.A.	135° 56′ 18″	·652 p	+ 4	= + 0·13			
			″					″	
197	Nov.22·27911	+ 18·277 D.	1274·39	+ 0·127 s	− 0·806 π	− 0·670 α	− 0·706 δ	= + 0·13	
198	22·28467	„	1277·59	·128	·793	·670	·706	− 0·08	
199	22·29077	„	1281·11	·128	·780	·670	·707	− 0·07	
200	22·29643	„	1284·38	·128	·765	·670	·707	+ 0·26	
			° ′ ″					″	″
202	Nov.22·42344	+ 18·277 P.A.	224 22 10	+ 0·136 p	+ 0·749 π	− 0·676 α	+ 0·700 δ	= + 118	= + 0·78
203	22·43540	„	224 18 31	·137	·782	·677	·699	+ 123	+ 0·81
			″		″				
201	Nov.22·3	Stands. D.	6522·16	+ 0·652 s	= − 0·64				
204	22·4	„ P.A.	135° 56′ 18″	·652 p	+ 4	= + 0·13			
			″					″	
205	Nov.23·43521	+ 19·324 D.	5923·28	+ 0·592 s	− 0·828 π	+ 0·398 α	− 0·907 δ	= − 0·57	
208	23·45593	„	5930·08	·593	·849	·396	·908	− 0·74	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
206	Nov.23·44163	+ 16·247 D.	6714·71	+ 0·671 s	+ 0·747 π	− 0·029 α	+ 0·999 δ	= + 0·23
207	23·44795	„	6711·65	·671	·742	·029	·999	− 0·02
209	Nov.24·41141	+ 19·324 D.	6269·16	+ 0·627 s	− 0·796 π	+ 0·342 α	− 0·933 δ	= − 0·63
212	24·44232	„	6280·24	·628	·827	·339	·934	− 0·43
210	Nov.24·42304	+ 16·247 D.	6253·69	+ 0·625 s	+ 0·763 π	− 0·066 α	+ 0·998 δ	= + 0·45
211	24·42985	„	6250·53	·625	·760	·066	·998	+ 0·45
			° ′ ″					″
214	Nov.28·41422	+ 17·315 P.A.	11 37 4	+ 0·158 p	− 0·480 π	+ 0·932 α	− 0·201 δ	= −77 = − 0·59
215	28·42509	„	11 35 56	·158	·522	·932	·201	−22 − 0·17
216	28·43506	„	11 34 56	·157	·561	·932	·201	+25 + 0·19
217	28·44657	„	11 33 50	·157	·599	·932	·200	+ 4 + 0·03
218	28·45668	„	11 32 57	·156	·635	·932	·200	−31 − 0·23
219	28·46448	„	11 32 16	·156	·668	·932	·200	−22 − 0·16
					″			
213	Nov.28·4	Stands. P.A.	135 56 18	+ 0·652 p	= − 14	= − 0·44		
220	28·5	„	„	·652	+ 7	+ 0·22		
			″					″
221	Nov.29·37418	+ 17·315 D.	1161·69	+ 0·116 s	+ 0·678 π	+ 0·119 α	+ 0·978 δ	= + 0·73
222	29·38237	„	1158·09	·116	·671	·199	·978	+ 0·73
224	29·39692	„	1151·69	·115	·649	·199	·978	+ 0·69
225	29·40028	„	1150·21	·115	·642	·199	·978	+ 0·59
			′ ″					″
226	Nov.29·40617	+ 17·315 P.A.	12 1 8	+ 0·115 p	− 0·407 π	+ 0·931 α	− 0·208 δ	= −10 = − 0·06
227	29·41277	„	12 0 48	·114	·485	·931	·208	−30 − 0·16
229	29·43139	„	11 59 58	·114	·514	·931	·208	−53 − 0·29
230	29·43803	„	11 59 42	·113	·554	·931	·208	+73 + 0·40
			″					
223	Nov.29·4	Stands. D.	6522·23	+ 0·652 s	= − 0·44	″		
228	29·4	„ P.A.	135° 56′ 18″	·652 p	+ 4	= + 0·13		
								″
231	Nov.30·32940	+ 17·315 D.	763·79	+ 0·076 s	+ 0·724 π	+ 0·245 α	+ 0·966 δ	= + 0·64
232	30·33731	„	760·48	·076	·716	·246	·966	+ 0·71
233	30·34424	„	757·58	·076	·706	·246	·966	+ 0·62
234	30·35074	„	754·86	·076	·699	·246	·966	+ 0·71
235	Nov.30·4	Stands. D.	6522·24	+ 0·652 s	= − 0·55	″		
236	30·4	„ P.A.	135° 56′ 18″	·652 p	+ 8	= + 0·25		
			″					″
245	Dec. 2·41454	+ 17·315 D.	210·77	+ 0·021 s	− 0·637 π	+ 0·859 α	− 0·433 δ	= − 1·22
246	2·42094	„	211·81	·021	·659	·855	·441	− 0·74
247	2·42620	„	212·70	·021	·679	·852	·448	− 0·80
248	2·43161	„	213·62	·021	·699	·849	·456	− 1·00
249	2·43916	„	214·96	·021	·736	·842	·470	− 0·61
250	2·44476	„	215·97	·021	·752	·839	·477	− 1·07

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
237	Dec. 2·36593	+ 17·315 P.A.	110 47 13	+ 0·020 p	− 0·612 π	− 0·337 α	− 0·936 δ	= −575	= − 0·56
238	2·36986	,,	111 11 33	·020	·599	·345	·933	−526	− 0·51
239	2·37503	,,	111 43 24	·020	·585	·353	·929	−558	− 0·54
240	2·37959	,,	112 11 20	·020	·571	·362	·926	−639	− 0·65
241	2·38502	,,	112 44 28	·021	·556	·371	·918	−492	− 0·50
242	2·38865	,,	113 6 24	·021	·541	·380	·918	−593	− 0·60
			″		″				
244	Dec. 2·4	Stands. D.	6522·26	+ 0·652 s	= − 0·19				
243	2·4	,, P.A.	135° 56′ 18″	·652 p	−11	= − 0·35			
			″						
251	Dec. 3·37344	+ 17·315 D.	511·62	+ 0·051 s	− 0·717 π	+ 0·443 α	− 0·885 δ	= − 0·94	
252	3·38132	,,	514·30	·051	·729	·441	·887	− 0·98	
254	3·39681	,,	519·62	·052	·754	·438	·889	− 0·80	
255	3·40212	,,	521·45	·052	·761	·436	·890	− 0·73	
256	3·41096	,,	524·51	·052	·775	·434	·891	− 0·56	
257	3·41902	,,	527·31	·053	·787	·431	·892	− 0·92	
258	3·42740	,,	530·24	·053	·794	·429	·893	− 0·85	
					″				
253	Dec. 3·4	Stands. D.	6522·27	+ 0·652 s	= + 0·48				
259	Dec. 4·38135	+ 17·315 D.	879·61	+ 0·088 s	− 0·735 π	+ 0·345 α	− 0·933 δ	= − 0·72	
262	4·44861	,,	903·86	·090	·786	·339	·935	− 1·08	
260	Dec. 4·39223	+ 16·247 D.	2308·65	+ 0·231 s	+ 0·743 π	− 0·442 α	+ 0·886 δ	= + 0·19	
261	4·40342	,,	2304·77	·231	·763	·443	·886	+ 0·81	
263	Dec. 5·36930	+ 17·315 D.	1242·87	+ 0·124 s	− 0·721 π	+ 0·329 α	− 0·939 δ	= − 0·59	
266	5·39370	,,	1251·37	·125	·746	·329	·939	− 0·34	
267	5·39941	,,	1253·61	·125	·752	·329	·939	− 0·55	
270	5·43060	,,	1264·84	·126	·770	·328	·940	− 0·68	
264	Dec. 5·37779	+ 16·247 D.	1952·18	+ 0·195 s	+ 0·717 π	− 0·470 α	+ 0·871 δ	= + 0·12	
265	5·38422	,,	1949·96	·195	·731	·470	·871	+ 0·18	
268	5·40995	,,	1941·04	·194	·769	·471	·870	+ 0·85	
269	5·41942	,,	1937·73	·194	·783	·471	·870	+ 0·67	
271	Dec. 6·36275	+ 17·315 D.	1606·48	+ 0·161 s	− 0·705 π	+ 0·339 α	− 0·935 δ	= − 0·61	
274	6·38117	,,	1612·98	·161	·729	·339	·935	...	
272	Dec. 6·36791	+ 16·247 D.	1592·01	+ 0·159 s	+ 0·693 π	− 0·490 α	+ 0·858 δ	= + 0·20	
273	6·37279	,,	1590·32	·159	·705	·490	·858	+ 0·29	
			(274 was an	incomplete	measure	and	not	used.)	
275	Dec. 7·37086	+ 17·315 D.	1974·29	+ 0·197 s	− 0·713 π	+ 0·363 α	− 0·924 δ	= − 0·19	
278	7·38886	,,	1986·65	·198	·737	·363	·924	− 0·46	
279	7·39486	,,	1982·88	·198	·742	·363	·924	− 0·42	
282	7·42265	,,	1992·69	·199	·764	·363	·924	− 0·54	

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No.	Date. 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
276	Dec. 7·37644	+ 16·247 D.	1221·64	+ 0·122 s	+ 0·707 π	− 0·500 α	+ 0·852 δ	= + 0·21
277	7·38251	„	1219·51	·122	·718	·501	·852	− 0·03
280	7·40570	„	1211·30	·121	·757	·501	·852	+ 0·28
281	7·41352	„	1208·52	·121	·769	·501	·851	− 0·06
284	Dec. 8·36500	+ 16·247 D.	853·81	+ 0·085 s	+ 0·689 π	− 0·485 α	+ 0·862 δ	= − 0·19
285	8·37457	„	850·41	·085	·708	·485	·862	− 0·20
286	8·40571	„	839·26	·084	·755	·485	·862	+ 0·29
287	8·41390	„	836·31	·084	·766	·485	·862	+ 0·02
			″					
283	Dec. 8·4	Stands. D.	6522·32	+ 0·652 s	= − 0·57			
288	Dec. 9·38715	+ 16·247 D.	474·07	+ 0·047 s	+ 0·726 π	− 0·378 α	+ 0·918 δ	= − 0·06
290	9·39934	„	469·76	·047	·740	·376	·919	− 0·07
291	9·40506	„	467·74	·047	·744	·375	·919	− 0·10
292	9·41110	„	465·57	·047	·748	·374	·920	− 0·16
293	9·41716	„	463·40	·046	·753	·373	·921	− 0·08
			″					
289	Dec. 9·4	Stands. D.	6522·33	+ 0·652 s	= − 0·36			
294	Dec. 10·36678	+ 16·247 D.	180·95	+ 0·018 s	+ 0·485 π	+ 0·425 α	+ 0·896 δ	= + 0·34
295	10·37192	„	180·25	·018	·470	·433	·891	+ 0·15
296	10·37647	„	179·65	·018	·453	·441	·887	+ 0·12
297	10·38150	„	179·00	·018	·436	·449	·883	+ 0·40
298	10·38536	„	178·51	·018	·417	·457	·878	+ 0·53
299	10·39032	„	177·89	·018	·399	·466	·873	+ 0·32
			° ′ ″				″	″
300	Dec. 10·39448	+ 16·247 P.A.	29 39 43	+0·0178 s	− 0·629 π	+ 0·831 α	− 0·495 δ	= + 247 = + 0·21
301	10·40059	„	30 22 0	·0177	·648	·826	·504	+ 779 + 0·67
304	10·43225	„	34 8 29	·0174	·763	·794	·558	+ 127 + 0·11
305	10·44079	„	35 11 37	·0173	·785	·783	·574	+ 334 + 0·28
306	10·44436	„	35 38 15	·0173	·801	·777	·583	+ 511 + 0·43
307	10·44762	„	36 2 41	·0172	·807	·774	·585	+ 496 + 0·41
308	10·45115	„	36 28 57	·0172	·818	·771	·591	+ 188 + 0·16
309	10·45529	„	37 0 38	·0171	·834	·765	·600	+ 449 + 0·37
			″		″			
303	Dec. 10·4	Stands D.	6522·34	+ 0·652 s	= + 0·00			
302	10·4	„ P.A.	135° 56′ 17″	·652 p	+ 8	= + 0·25		

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Equations of Condition for Leipzig Observations.

No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
25	Oct. 18·26328	+ 24·358 D.	5116·96	+ 0·512 s	+ 0·910 π	+ 0·460 α	− 0·865 δ	= + 0·72
28	18·30837	„	5116·13	·512	·821	·455	·868	+ 0·50
29	18·32178	„	5115·90	·512	·799	·454	·869	+ 0·51
32	18·35175	„	5115·33	·512	·721	·451	·871	+ 0·09
26	Oct. 18·28137	+ 22·372 D.	4258·42	+ 0·426 s	− 0·900 π	− 0·553 α	+ 0·798 δ	= − 0·31
27	18·29872	„	4260·27	·426	·861	·556	·796	− 0·26
30	18·33161	„	4263·97	·426	·794	·559	·793	− 0·16
31	18·34174	„	4265·15	·426	·766	·560	·792	− 0·60
34	Oct. 24·26178	+ 22·354 D.	323·92	+ 0·032 s	+ 0·486 π	− 0·245 α	− 0·964 δ	= + 0·18
37	24·29749	„	344·78	·034	·408	·299	·946	− 0·06
			° ′ ″					″
33	Oct. 24·24632	+ 22·354 P.A.	194 4 42	+ 0·032 p	+ 0·787 π	− 0·893 α	+ 0·241 δ	= +284 = + 0·44
38	24·30817	„	199 36 40	·034	·721	·867	·340	+240 + 0·40
			″		″			
35	Oct. 24·3	Stands. D.	6521·85	+ 0·652 s	= + 0·34	″		
36	24·3	„ P.A.	135° 56′ 17″	·652 p	+19	= + 0·60		
			″					″
40	Oct. 25·24838	+ 22·347 D.	1785·96	+ 0·179 s	− 0·152 π	+ 0·569 α	+ 0·787 δ	= + 0·17
47	25·30845	„	1741·26	·174	·150	·561	·793	− 0·57
			° ′ ″					″
41	Oct. 25·25552	+ 22·347 P.A.	38 1 39	+ 0·179 p	+ 0·916 π	+ 0·726 α	− 0·616 δ	= −27 = − 0·23
46	25·30242	„	37 36 25	·174	·828	·730	·611	+30 + 0·25
			″					
43	Oct. 25·27727	+ 22·354 D.	1059·76	+ 0·106 s	+ 0·028 π	− 0·656 α	− 0·703 δ	= + 0·10
44	25·28240	„	1063·74	·106	·028	·656	·703	+ 0·73
			° ′ ″					″
42	Oct. 25·26836	+ 22·354 P.A.	225 13 6	+ 0·106 p	− 0·900 π	− 0·649 α	− 0·710 δ	= +14 = + 0·07
45	25·28839	„	225 24 32	·106	·857	·647	·712	+63 + 0·32
					″	″		
39	Oct. 25·2	Stands. P.A.	135 56 17	+ 0·652 p	= − 3	= − 0·10		
48	25·3	„ P.A.	„	·652	+ 5	+ 0·16		
49	25·3	„ P.A.	„	·652	− 0	− 0·00		
			″					″
53	Oct. 26·25515	+ 22·347 D.	1056·02	+ 0·106 s	− 0·362 π	+ 0·379 α	+ 0·911 δ	= − 0·55
54	26·26930	„	1046·52	·105	·354	·374	·915	− 0·04
			° ′ ″					″
52	Oct. 26·24038	+ 22·347 P.A.	24 35 35	+ 0·107 p	+ 0·874 π	+ 0·839 α	− 0·416 δ	= +21 = + 0·11
55	26·28204	„	23 34 45	·104	·802	·846	·401	−20 − 0·10
			″		″			
50	Oct. 26·2	Stands. D.	6521·88	+ 0·652 s	= + 0·01	″		
51	26·2	„ P.A.	135° 56′ 17″	·652 p	− 7	= − 0·22		
56	26·3	„ P.A.	„	·652	+ 4	+ 0·13		

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
57	Oct. 28·21701	+ 20·404 D	5463·96	+ 0·546 s	− 0·958 π	− 0·480 α	+ 0·855 δ	= + 0·21
60	28·25399	,,	5462·80	·546	·902	·484	·852	− 0·07
61	28·26745	,,	5462·45	·546	·876	·486	·851	+ 0·27
64	28·31284	,,	5461·58	·546	·784	·491	·848	− 0·05
58	Oct. 28·22708	+ 22·331 D.	4307·19	+ 0·431 s	+ 0·892 π	+ 0·832 α	− 0·438 δ	= + 0·12
59	28·23908	,,	4302·27	·430	·877	·831	·439	+ 0·08
62	28·28471	,,	4284·85	·429	·796	·828	·445	+ 0·45
63	28·29851	,,	4277·75	·428	·760	·827	·448	+ 0·19
65	Nov. 5·19337	+ 21·321 D.	878·02	+ 0·088 s	+ 0·915 π	+ 0·822 α	− 0·470 δ	= − 0·53
69	5·24931	,,	860·73	·086	·842	·799	·514	− 0·36
			° ′ ″					″ ″
66	Nov. 5·20753	+ 21·321 P.A.	118 47 21	+ 0·088 p	+ 0·304 π	− 0·447 α	− 0·876 δ	= +167 = + 0·71
70	5·25879	,,	120 26 18	·086	·247	·487	·858	+144 + 0·60
			″		″			
68	Nov. 5·2	Stands. D.	6521·99	+ 0·652 s	= − 0·06	″		
67	5·2	,, P.A.	135° 56′ 17″	·652 p	+ 1	= + 0·03		
			″					″
71	Nov. 7·19684	+ 19·340 D.	5696·10	+ 0·570 s	− 0·732 π	− 0·028 α	+ 0·999 δ	= − 1·03
74	7·22962	,,	5679·33	·568	·691	·031	·999	− 1·03
			″					
72	Nov. 7·20867	+ 21·304 D.	4840·03	+ 0·484 s	+ 0·926 π	+ 0·489 α	− 0·851 δ	= − 0·21
73	7·22015	,,	4841·48	·484	·909	·488	·852	− 0·04
75	Nov. 8·18857	+ 21·304 D.	5046·45	+ 0·505 s	+ 0·915 π	+ 0·361 α	− 0·922 δ	= − 0·50
78	8·21580	,,	5053·54	·505	·874	·357	·924	− 0·22
79	8·22842	,,	5056·83	·506	·847	·355	·925	− 0·17
82	8·26352	,,	5066·07	·507	·783	·351	·927	+ 0·03
76	Nov. 8·19783	+ 19·340 D.	5204·93	+ 0·520 s	− 0·801 π	− 0·139 α	+ 0·989 δ	= − 1·07
77	8·20721	,,	5200·84	·520	·787	·141	·989	− 0·94
80	8·23981	,,	5186·71	·519	·736	·144	·988	− 0·88
81	8·25054	,,	5182·07	·518	·722	·146	·988	− 0·70
83	Nov. 9·19015	+ 19·340 D.	4801·74	+ 0·480 s	− 0·870 π	− 0·266 α	+ 0·958 δ	= − 0·74
86	9·22015	,,	4791·46	·479	·823	·269	·957	− 0·50
87	9·23525	,,	4786·36	·479	·799	·270	·956	− 0·44
90	9·26433	,,	4776·66	·478	·747	·276	·955	− 0·91
84	Nov. 9·20169	+ 21·304 D.	5383·61	+ 0·538 s	+ 0·840 π	+ 0·232 α	− 0·969 δ	= − 0·52
85	9·21076	,,	5386·97	·539	·823	·231	·969	+ 0·19
88	9·24615	,,	5400·17	·540	·762	·227	·970	− 0·30
89	9·25732	,,	5404·37	·540	·743	·225	·970	+ 0·06

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
91	Nov.10·17834	+ 20·341 D.	3975·87	+ 0·397 s	+ 0·833 π	+ 0·891 α	− 0·308 δ	= − 1·10
94	10·20481	,,	3965·82	·396	·807	·889	·311	− 0·88
95	10·21347	,,	3962·52	·396	·796	·888	·313	− 1·05
92	Nov.10·18792	+ 19·340 D.	4498·24	+ 0·450 s	− 0·922 π	− 0·406 α	+ 0·901 δ	= + 0·06
93	10·19665	,,	4496·22	·450	·909	·408	·900	− 0·33
96	10·22178	,,	4490·49	·449	·869	·411	·899	− 0·09
97	Nov.11·18496	+ 19·340 D.	4312·49	+ 0·431 s	− 0·950 π	− 0·547 α	+ 0·812 δ	= − 0·14
100	11·21134	,,	4309·70	·431	·911	·550	·810	− 0·11
101	11·22155	,,	4308·66	·431	·892	·551	·809	− 0·35
104	11·24715	,,	4306·18	·431	·838	·555	·806	− 0·00
98	Nov.11·19464	+ 20·341 D.	3676·26	+ 0·368 s	+ 0·887 π	+ 0·820 α	− 0·485 δ	= − 1·03
99	11·20242	,,	3674·49	·367	·880	·819	·486	− 0·79
102	11·23090	,,	3668·00	·367	·829	·816	·490	− 0·99
103	11·23787	,,	3666·41	·367	·815	·816	·492	− 0·68
105	Nov.12·17672	+ 20·341 D.	3550·69	+ 0·355 s	+ 0·953 π	+ 0·709 α	− 0·654 δ	= − 1·12
108	12·20803	,,	3549·01	·355	·901	·705	·659	− 0·64
109	12·22457	,,	3548·13	·355	·872	·704	·660	− 0·41
112	12·25399	,,	3546·59	·355	·810	·700	·666	− 0·51
106	Nov.12·18608	+ 19·340 D.	4252·50	+ 0·425 s	− 0·945 π	− 0·674 α	+ 0·694 δ	= − 0·22
107	12·19595	,,	4252·69	·425	·929	·675	·693	− 0·01
110	12·23503	,,	4253·70	·425	·854	·680	·688	− 0·13
111	12·24488	,,	4254·02	·425	·830	·681	·687	+ 0·02
115	Nov.14·18049	+ 18·283 D.	2954·89	+ 0·295 s	− 0·799 π	− 0·154 α	+ 0·987 δ	= − 0·07
118	14·21090	,,	2941·54	·294	·757	·160	·986	+ 0·32
119	14·22137	,,	2936·96	·294	·743	·162	·985	+ 0·01
122	14·24914	,,	2924·85	·293	·700	·168	·984	+ 0·20
116	Nov.14·18977	+ 20·341 D.	3806·85	+ 0·381 s	+ 0·892 π	+ 0·411 α	− 0·900 δ	= − 1·08
117	14·20156	,,	3809·95	·381	·875	·409	·901	− 0·62
120	14·22913	,,	3817·21	·382	·820	·404	·902	− 0·99
121	14·23793	,,	3819·55	·382	·806	·403	·903	− 0·74
123	Nov.15·17913	+ 20·341 D.	4138·36	+ 0·414 s	+ 0·847 π	+ 0·270 α	− 0·957 δ	= − 0·16
126	15·20952	,,	4149·65	·415	·800	·266	·958	− 0·36
127	15·22022	,,	4153·64	·415	·783	·265	·959	− 0·59
130	15·24166	,,	4161·64	·416	·748	·263	·960	− 0·47
124	Nov.15·19268	+ 18·283 D.	2556·32	+ 0·256 s	− 0·868 π	− 0·358 α	+ 0·925 δ	= + 0·49
125	15·20229	,,	2553·38	·255	·852	·360	·924	+ 0·64
128	15·22781	,,	2545·65	·255	·807	·365	·921	+ 0·55
129	15·23476	,,	2543·58	·254	·793	·367	·921	+ 0·66

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
131	Nov.17·18036	+ 18·283 D.	2262·11	+ 0·226 s	− 0·895 π	− 0·772 α	+ 0·573 δ	= + 0·73
134	17·22115	„	2264·59	·227	·819	·780	·562	+ 0·73
135	17·23090	„	2265·27	·227	·796	·781	·560	+ 0·63
132	Nov.17·18997	+ 19·329 D.	2145·84	+ 0·213 s	+ 0·892 π	+ 0·731 α	− 0·633 δ	= ...
133	17·20244	„	2145·80	·213	·875	·729	·636	...
136	17·23827	„	2145·77	·213	·791	·721	·644	...
			(132, 3, 6.	The observations do not refer to Iris and + 19°·329.)				
								″
138	Nov.18·18127	+ 18·277 D.	1283·83	+ 0·128 s	− 0·402 π	+ 0·356 α	+ 0·926 δ	= + 0·08
141	18·21061	„	1265·35	·127	·388	·352	·928	− 0·07
			° ′ ″					″ ″
137	Nov.18·17267	+ 18·277 P.A.	22 12 34	+ 0·128 p	+ 0·831 π	+ 0·873 α	− 0·379 δ	= − 77 = − 0·48
142	18·22149	„	21 48 25	·127	·746	·877	·371	− 29 − 0·18
			″		″			
139	Nov.18·2	Stands. D.	6522·12	+ 0·652 s	= + 0·06	″		
140	18·2	„ P.A.	135° 56′ 18″	·652 p	− 6	= − 0·19		
			″					″
144	Nov.29·17654	+ 17·315 D.	1234·70	+ 0·124 s	− 0·494 π	+ 0·203 α	+ 0·977 δ	= + 1·16
147	29·20942	„	1220·75	·122	·474	·203	·977	+ 0·77
			° ′ ″					″ ″
143	Nov.29·16579	+ 17·315 P.A.	12 18 3	+ 0·124 p	+ 0·673 π	+ 0·930 α	− 0·213 δ	= − 12 = − 0·07
148	29·21798	„	12 18 10	·122	·571	·930	·213	− 48 − 0·28
			″		″			
145	Nov.29·2	Stands. D.	6522·18	+ 0·652 s	= − 0·32	″		
146	29·2	„ P.A.	135° 56′ 18″	·652 p	− 7	= − 0·22		
			″					″
150	Dec. 3·18279	+ 17·315 D.	458·71	+ 0·046 s	+ 0·764 π	+ 0·485 α	− 0·861 δ	= − 0·80
153	3·21710	„	470·15	·047	·697	·474	·867	− 0·49
			° ′ ″					″ ″
149	Dec. 3·17181	+ 17·315 P.A.	149 15 34	+ 0·046 p	− 0·133 π	− 0·819 α	− 0·512 δ	= + 139 = + 0·31
154	3·22503	„	150 15 35	·047	·071	·828	·496	+ 51 + 0·11
			″		″			
151	Dec. 3·2	Stands. D.	6522·27	+ 0·652 s	= + 0·14	″		
152	3·2	„ P.A.	135° 56′ 18″	·652 p	= + 2	= + 0·06		
								″
155	Dec. 5·15386	+ 17·315 D.	1178·53	+ 0·118 s	+ 0·753 π	+ 0·331 α	− 0·938 δ	= − 0·69
160	5·20664	„	1197·13	·120	·675	·330	·939	− 0·42
			° ′ ″					″
156	Dec. 5·16250	+ 17·315 P.A.	159 41 54	+ 0·118 p	− 0·276 π	− 0·896 α	− 0·347 δ	= − 0 = − 0·00
159	5·19583	„	159 43 50	·120	·226	·896	·346	+ 85 + 0·49
			″		″			
158	Dec. 5·2	Stands. D.	6522·29	+ 0·652 s	= − 0·62	″		
157	5·2	„ P.A.	135° 56′ 17″	·652 p	− 6	= − 0·19		

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	″					″	
161	Dec. 6·15213	+ 17·315 D.	1544·10	+ 0·154 s	+ 0·746 π	+ 0·337 α	− 0·936 δ	= − 0·42	
164	6·17283	„	1551·37	·155	·723	·337	·936	− 0·35	
165	6·18309	„	1554·97	·155	·703	·337	·936	− 0·32	
168	6·21384	„	1565·73	·157	·657	·338	·936	− 0·31	
162	Dec. 6·15873	+ 16·247 D.	1653·63	+ 0·165 s	− 0·771 π	− 0·487 α	+ 0·860 δ	= + 0·22	
163	6·16524	„	1651·36	·165	·763	·487	·860	+ 0·30	
166	6·19279	„	1641·79	·164	·721	·488	·860	+ 0·19	
167	6·20169	„	1638·70	·164	·703	·488	·859	+ 0·24	
169	Dec. 7·15327	+ 16·247 D.	1289·18	+ 0·129 s	− 0·775 π	− 0·499 α	+ 0·852 δ	= + 0·17	
172	7·17974	„	1279·86	·128	·731	·500	·852	+ 0·36	
173	7·19107	„	1275·88	·128	·711	·501	·852	+ 0·12	
170	Dec. 7·16160	+ 17·315 D.	1912·39	+ 0·191 s	+ 0·735 π	+ 0·359 α	− 0·927 δ	= − 0·23	
171	7·16909	„	1915·02	·191	·720	·359	·927	− 0·44	
174	7·20308	„	1926·88	·193	·668	·359	·927	− 0·49	
178	Dec. 8·16571	+ 16·247 D.	913·88	+ 0·091 s	− 0·744 π	− 0·492 α	+ 0·856 δ	= + 0·39	
179	8·17371	„	911·03	·091	·729	·492	·856	+ 0·38	
			° ′ ″					″	″
177	Dec. 8·15741	+ 16·247 P.A.	229 3 52	+ 0·091 p	+ 0·123 π	+ 0·819 α	+ 0·514 δ	= +124	= + 0·55
180	8·18048	„	229 5 39	·091	·100	·819	·514	+137	+ 0·60
			″		″				
175	Dec. 8·1	Stands. D.	6522·32	+ 0·652 s	= − 0·81				
182	8·2	„ D.	„	·652	− 0·83				
			° ′ ″		″	″			
176	Dec. 8·1	Stands. P.A.	135 56 17	+ 0·652 p	= − 9	= − 0·28			
181	8·2	„ P.A.	„	·652	− 6	− 0·19			
			″					″	
187	Dec. 13·15365	+ 16·247 D.	1154·77	+ 0·116 s	+ 0·676 π	+ 0·841 α	− 0·479 δ	= + 0·30	
190	13·18097	„	1166·25	·117	·623	·841	·480	+ 0·17	
			° ′ ″						″
188	Dec. 13·16087	+ 16·247 P.A.	118 38 41	+ 0·116 p	+ 0·269 π	− 0·459 α	− 0·878 δ	= + 13	= + 0·07
189	13·17217	„	118 39 32	·117	·270	·460	·878	− 37	− 0·21
			″		″				
186	Dec. 13·1	Stands. D.	6522·37	+ 0·652 s	= − 1·07				
191	13·2	„ D.	„	·652	− 0·73				
			° ′ ″			″			
185	Dec. 13·1	Stands. P.A.	135 56 17	+ 0·652 p	= − 7	= − 0·22			
192	13·2	„ P.A.	„	·652	− 3	− 0·10			

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Equations of Condition for Oxford Observations.

No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
1	Oct. 30·36982	+ 22·331 D.	3795·32	+ 0·380 s	+ 0·722 π	+ 0·593 α	− 0·765 δ	= + 1·09
4	30·54623	„	3784·39	·379	·281	·564	·793	+ 1·63
2	Oct. 30·42861	+ 22·404 D.	5644·68	+ 0·565 s	− 0·515 π	− 0·712 α	+ 0·639 δ	= + 1·58
3	30·49657	„	5661·24	·566	·303	·719	·631	+ 1·11
5	Nov.13·30695	+ 20·341 D.	3613·55	+ 0·361 s	+ 0·774 π	+ 0·546 α	+ 0·814 δ	= + 0·70
8	13·47960	„	3638·11	·364	·368	·517	·834	+ 0·44
6	Nov.13·36752	+ 19·340 D.	4343·88	+ 0·434 s	− 0·543 π	− 0·796 α	+ 0·532 δ	= + 0·67
7	13·42859	„	4354·83	·436	·321	·801	·522	+ 1·53
9	Nov.16·36359	+ 19·329 D.	2199·36	+ 0·220 s	+ 0·469 π	+ 0·863 α	− 0·402 δ	= − 1·70
12	16·51399	„	2169·20	·217	·009	·843	·445	+ 0·02
10	Nov.16·41122	+ 18·283 D.	2293·04	+ 0·229 s	− 0·460 π	− 0·628 α	+ 0·745 δ	= + 0·98
11	16·45997	„	2289·32	·229	·324	·639	·735	+ 1·72
13	Nov.20·34	+ 18·277 D.	313·11	+ 0·031 s	− 0·414 π	− 0·923 α	+ 0·214 δ	= − 0·17
16	20·51	„	370·43	·037	·352	·943	− 0·055	+ 0·55
			° ′ ″					″ ″
13	Nov.20·34	+ 18·277 P.A.	282 30 49	+ 0·031 p	− 0·479 π	+ 0·202 α	+ 0·976 δ	= + 597 = + 1·05
16	20·51	„	266 44 15	·037	·542	− 0·051	·998	+ 33 + 0·16
			″		″			
14	Nov.20·4	Stands. D.	6522·14	+ 0·652 s	= − 0·44			
15	20·4	„ D.	„	·652	− 0·48			
			° ′ ″			″		
14	Nov.20·4	Stands. P.A.	135 56 18	+ 0·652 p	= +77	= + 2·45		
15	20·4	„ P.A.	„	·652	+12	+ 0·38		
		(The computed values have been interpolated for each pointing, and the means then taken.)						
			″					″
17	Dec. 6·35	+ 16·247 D.	1593·58	+ 0·159 s	− 0·532 π	− 0·415 α	+ 0·901 δ	= − 0·69
20	6·59	„	1499·77	·150	·335	·417	·900	− 1·72
			° ′ ″					″ ″
17	Dec. 6·35	+ 16·247 P.A.	329 4 42	+ 0·159 p	− 0·075 π	+ 0·861 α	+ 0·433 δ	= − 111 = − 0·86
20	6·59	„	328 31 35	·150	·767	·860	·436	− 8 − 0·06
			″		″			
18	Dec. 6·4	Stands. D.	6522·30	+ 0·652 s	= + 0·82			
19	6·4	„ D.	„	·652	+ 0·56			
			° ′ ″			″		
18	Dec. 6·4	Stands. P.A.	135 56 17	+ 0·652 p	= −82	= − 2·60		
19	6·4	„ P.A.	„	·652	− 2	− 0·06		
		(Also here the times for the separate pointings were used, and on Dec. 9 similarly.)						

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
21	Dec. 9·37	+ 16·247 D.	468·08	+ 0·047 s	− 0·465 π	− 0·385 α	+ 0·916 δ	= + 0·17
22	9·44	,,	443·84	·044	·392	·372	·920	+ 0·03
			° ′ ″					″ ″
21	Dec. 9·37	+ 16·247 P.A.	336 17 43	+ 0·047 p	− 0·208 π	+ 0·876 α	+ 0·404 δ	= + 652 = + 1·50
22	9·44	,,	337 5 29	·044	·418	·870	·389	+ 76 + 0·16
			″		″			
23	Dec. 9·4	Stands. D.	6522·33	+ 0·652 s	= + 0·77			
24	9·4	,, D.	,,	·652	+ 1·45			
			° ′ ″			″		
23	Dec. 9·4	Stands. P.A.	135 56 17	+ 0·652 p	= −48	= − 1·52		
24	9·4	,, P.A.	,,	·652	−43	− 1·36		

Equations of Condition for Yale Observations.

		°	″					″
1	Oct. 10·55504	+ 24·376 D.	1167·15	+ 0·117 s	+ 0·800 π	+ 0·882 α	− 0·254 δ	= − 0·25
3	10·56051	,,	1165·11	·117	·790	·881	·256	− 0·05
7	10·57976	,,	1157·89	·116	·744	·881	·260	− 0·28
9	10·58453	,,	1156·09	·116	·732	·880	·262	− 0·34
			° ′ ″					″ ″
2	Oct. 10·55507	+ 24·376 P.A.	104 46 14	+ 0·117 p	+ 0·303 π	− 0·232 α	− 0·967 δ	= + 67 = + 0·38
4	10·56054	,,	104 50 50	·117	·294	·233	·966	+ 86 + 0·48
8	10·57990	,,	105 7 22	·116	·267	·237	·966	+ 45 + 0·25
10	10·58451	,,	105 11 22	·116	·258	·239	·965	+115 + 0·65
			″		″			
5	Oct. 10·6	Stands. D.	6521·70	+ 0·652 s	= − 0·23			
6	10·6	,, P.A.	45° 56′ 16″	·652 p	−31	= − 0·98		
			″					″
11	Oct. 10·91390	+ 24·376 D.	1032·32	+ 0·103 s	− 0·434 π	+ 0·853 α	− 0·357 δ	= − 0·37
13	10·91810	,,	1030·89	·103	·444	·852	·359	− 0·21
17	10·93338	,,	1025·74	·103	·458	·851	·363	− 0·27
19	10·93804	,,	1024·18	·102	·464	·850	·367	− 0·04
			° ′ ″					″ ″
12	Oct. 10·91393	+ 24·376 P.A.	110 58 6	+ 0·103 p	+ 0·628 π	− 0·326 α	− 0·934 δ	= +131 = + 0·65
14	10·91815	,,	111 3 16	·103	·645	·328	·933	+ 65 + 0·33
18	10·93345	,,	111 22 9	·102	·679	·332	·932	+ 91 + 0·45
20	10·93810	,,	111 27 55	·102	·696	·335	·931	+ 67 + 0·33
			″		″			
15	Oct. 10·9	Stands. D.	6521·70	+ 0·652 s	= − 0·75			
16	10·9	,, P.A.	45° 56′ 16″	·652 p	−16	= − 0·51		
			″					″
21	Oct. 11·54428	+ 24·376 D.	865·22	+ 0·086 s	+ 0·873 π	+ 0·743 α	− 0·581 δ	= − 0·89
23	11·55603	,,	862·23	·086	·851	·740	·585	− 0·38
27	11·61879	,,	846·33	·085	·660	·723	·612	− 0·23
29	11·62358	,,	845·13	·085	·649	·721	·614	+ 0·40

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
22	Oct. 11·54461	+ 24·376 P.A.	125 32 27	+ 0·086 p	− 0·001 π	− 0·531 α	− 0·814 δ	= − 36	= − 0·15
24	11·55689	,,	125 53 20	·086	·012	·534	·810	− 33	− 0·14
28	11·61887	,,	127 43 8	·085	·025	·558	·791	− 10	− 0·04
30	11·62363	,,	127 51 52	·085	·023	·560	·790	+102	+ 0·41
			″		″				
25	Oct. 11·6	Stands. D.	6521·71	+ 0·652 s	= + 0·57				
26	11·6	,, P.A.	45° 56′ 16″	·652 p	−25	= − 0·79			
			″					″	
31	Oct. 15·70071	+ 24·358 D.	5382·75	+ 0·538 s	+ 0·333 π	+ 0·673 α	− 0·675 δ	= + 0·26	
34	15·71276	,,	5379·96	·538	·297	·672	·676	+ 0·97	
35	15·71731	,,	5378·88	·538	·272	·671	·676	+ 0·68	
38	15·72930	,,	5376·14	·538	·224	·670	·677	+ 0·92	
32	Oct. 15·70568	+ 22·372 D.	4346·50	+ 0·435 s	− 0·334 π	− 0·241 α	+ 0·965 δ	= − 0·48	
33	15·70871	,,	4346·13	·435	·326	·242	·965	− 0·56	
36	15·72164	,,	4344·55	·434	·310	·243	·964	− 0·46	
37	15·72492	,,	4344·15	·434	·304	·245	·964	− 1·15	
39	Oct. 16·54802	+ 22·372 D.	4253·01	+ 0·425 s	− 0·709 π	− 0·344 α	+ 0·928 δ	= − 0·54	
42	16·56130	,,	4252·35	·425	·686	·346	·927	− 0·16	
43	16·57361	,,	4251·76	·425	·653	·347	·926	− 0·75	
46	16·58223	,,	4251·35	·425	·641	·348	·925	− 1·02	
48	16·68118	,,	4247·18	·425	·392	·361	·919	− 0·06	
49	16·68346	,,	4247·09	·425	·384	·361	·919	− 0·05	
40	Oct. 16·55529	+ 24·358 D.	5243·04	+ 0·524 s	+ 0·808 π	+ 0·612 α	− 0·741 δ	= + 1·07	
41	16·55751	,,	5242·67	·524	·803	·612	·741	+ 0·59	
44	16·57659	,,	5239·45	·524	·752	·610	·743	+ 0·19	
45	16·57903	,,	5239·03	·524	·737	·610	·743	+ 0·10	
47	16·67848	,,	5222·22	·522	·403	·602	·751	− 0·31	
50	16·68664	,,	5220·86	·522	·385	·602	·752	− 0·09	
51	Oct. 16·59972	+ 24·376 D.	2547·64	+ 0·256 s	− 0·112 π	− 0·646 α	− 0·709 δ	= − 1·79	
54	16·63121	,,	2567·03	·258	·067	·648	·707	+ 0·43	
52	Oct. 16·61551	+ 22·354 D.	5172·39	+ 0·517 s	+ 0·268 π	+ 0·805 α	+ 0·477 δ	= + 1·96	
53	16·62209	,,	5168·11	·517	·256	·805	·477	+ 1·85	
55	Oct. 17·53457	+ 24·358 D.	5141·01	+ 0·514 s	+ 0·828 π	+ 0·531 α	− 0·814 δ	= + 0·55	
58	17·54190	,,	5140·36	·514	·815	·531	·815	+ 0·21	
59	17·54474	,,	5140·10	·514	·803	·531	·815	+ 0·02	
62	17·55206	,,	5139·44	·514	·790	·530	·816	+ 0·21	
63	17·55454	,,	5139·22	·514	·777	·530	·816	+ 0·34	
66	17·56285	,,	5138·46	·514	·764	·529	·816	+ 0·52	
67	17·62290	,,	5133·02	·513	·585	·523	·821	+ 0·19	
70	17·62967	,,	5132·42	·513	·553	·522	·822	+ 0·19	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	′					″
56	Oct. 17·53780	+ 22·372 D.	4221·95	+ 0·422 s	− 0·796 π	− 0·464 α	+ 0·861 δ	= − 0·73
57	17·53969	,,	4222·03	·422	·788	·464	·861	− 0·14
60	17·54721	,,	4222·33	·422	·772	·465	·861	− 0·13
61	17·54944	,,	4222·42	·422	·764	·466	·861	− 0·30
64	17·55706	,,	4222·73	·422	·744	·467	·860	+ 0·03
65	17·55942	,,	4222·82	·422	·738	·467	·860	− 0·81
68	17·62551	,,	4225·97	·423	·557	·475	·854	− 0·52
69	17·62759	,,	4226·08	·423	·552	·476	·854	− 1·02
71	Oct. 17·57125	+ 24·376 D.	3145·92	+ 0·315 s	− 0·178 π	− 0·680 α	− 0·669 δ	= − 0·61
74	17·59051	,,	3158·30	·316	·159	·681	·669	− 0·60
75	17·59909	,,	3163·84	·316	·145	·681	·669	− 0·88
78	17·61660	,,	3175·21	·318	·119	·682	·668	− 0·89
72	Oct. 17·57922	+ 22·354 D.	4559·44	+ 0·456 s	+ 0·338 π	+ 0·806 α	+ 0·475 δ	= + 0·62
73	17·58433	,,	4556·03	·456	·329	·806	·475	+ 0·37
76	17·60543	,,	4541·89	·454	·285	·806	·475	+ 0·38
77	17·61070	,,	4538·35	·454	.273	·806	·475	+ 0·41
79	Oct. 17·85853	+ 22·354 D.	4367·24	+ 0·437 s	− 0·681 π	+ 0·806 α	+ 0·476 δ	= + 0·45
82	17·87970	,,	4352·66	·435	·749	·806	·476	+ 0·53
83	17·88988	,,	4345·67	·435	·781	·806	·476	+ 0·23
86	17·91276	,,	4330·04	·433	·838	·806	·476	+ 0·40
80	Oct. 17·86664	+ 24·376 D.	3342·73	+ 0·334 s	+ 0·702 π	− 0·689 α	− 0·658 δ	= − 0·53
81	17·87256	,,	3346·72	·335	·718	·690	·658	− 0·53
84	17·89818	,,	3363·93	·336	·810	·690	·658	− 0·67
85	17·90328	,,	3367·34	·337	·838	·691	·658	− 0·85
87	Oct. 18·52627	+ 22·372 D.	4283·04	+ 0·428 s	− 0·865 π	− 0·580 α	+ 0·774 δ	= − 0·54
90	18·53520	,,	4284·15	·428	·841	·580	·773	+ 0·24
91	18·53766	,,	4284·58	·428	·837	·581	·773	− 0·65
94	18·54516	,,	4285·62	·428	·816	·581	·772	− 0·65
96	18·60312	,,	4294·06	·429	·647	·589	·767	− 0·54
97	18·60537	,,	4294·40	·429	·641	·589	·767	− 0·54
100	18·61286	,,	4295·53	·429	·625	·590	·766	− 0·94
101	18·61485	,,	4295·83	·430	·609	·590	·766	− 0·27
88	Oct. 18·52927	+ 24·358 D.	5118·59	+ 0·512 s	+ 0·792 π	+ 0·432 α	− 0·882 δ	= + 0·51
89	18·53147	,,	5118·59	·512	·792	·432	·882	+ 0·62
92	18·54025	,,	5118·58	·512	·768	·431	·882	+ 0·11
93	18·54234	,,	5118·58	·512	·768	·431	·882	+ 0·12
95	18·60049	,,	5118·58	·512	·607	·425	·886	+ 0·21
98	18·60802	,,	5118·59	·512	·579	·424	·887	− 0·16
99	18·61061	,,	5118·60	·512	·579	·424	·887	+ 0·05
102	18·61752	,,	5118·62	·512	·560	·423	·887	− 0·44

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
103	Oct. 18·55522	+ 24·376 D.	3781·39	+ 0·378 s	− 0·214 π	− 0·702 α	− 0·643 δ	= − 0·63
106	18·56958	"	3790·98	·379	·203	·703	·642	− 0·27
107	18·57534	"	3794·85	·380	·197	·703	·642	− 0·87
110	18·58856	"	3803·74	·380	·179	·703	·642	− 0·47
104	Oct. 18·56077	+ 22·354 D.	3912·36	+ 0·391 s	+ 0·366 π	+ 0·808 α	+ 0·472 δ	= + 0·29
105	18·56435	"	3909·91	·391	·359	·808	·472	+ 0·84
108	18·58023	"	3898·99	·390	·335	·808	·472	+ 0·16
109	18·58365	"	3896·63	·390	·328	·808	·472	+ 0·27
111	Oct. 18·86518	+ 22·354 D.	3696·49	+ 0·370 s	− 0·713 π	− 0·808 α	+ 0·472 δ	= − 0·03
114	18·88208	"	3684·50	·368	·762	·808	·472	+ 0·18
115	18·88776	"	3680·48	·368	·783	·808	·472	+ 0·35
118	18·90551	"	3667·96	·367	·835	·808	·472	+ 0·71
112	Oct. 18·87151	+ 24·376 D.	4000·85	+ 0·400 s	+ 0·733 π	− 0·709 α	− 0·634 δ	= − 0·60
113	18·87588	"	4003·91	·400	·750	·709	·633	− 0·70
116	18·89326	"	4016·05	·402	·806	·710	·633	− 0·41
117	18·89850	"	4019·71	·402	·825	·710	·633	− 0·47
119	Oct. 20·86377	+ 24·376 D.	5378·51	+ 0·538 s	+ 0·740 π	− 0·733 α	− 0·603 δ	= + 0·16
122	20·88527	"	5394·53	·539	·808	·733	·603	− 0·12
123	20·89559	"	5402·20	·540	·837	·733	·603	− 0·13
126	20·92208	"	5421·80	·542	·899	·733	·602	+ 0·15
120	Oct. 20·87110	+ 22·354 D.	2297·82	+ 0·230 s	− 0·754 π	+ 0·820 α	+ 0·449 δ	= + 0·02
121	20·87645	"	2293·83	·229	·770	·821	·449	+ 0·44
124	20·90379	"	2272·94	·227	·851	·821	·448	− 0·02
125	20·90988	"	2268·96	·227	·868	·821	·448	+ 0·46
127	Oct. 21·52218	+ 23·326 D.	4178·25	+ 0·418 s	+ 0·847 π	+ 0·538 α	− 0·807 δ	= + 0·17
130	21·53669	"	4177·11	·418	·801	·536	·805	+ 0·17
131	21·54012	"	4176·84	·418	·792	·535	·805	− 0·05
134	21·54660	"	4176·34	·418	·778	·534	·804	− 0·05
135	21·54953	"	4176·12	·418	·764	·534	·804	+ 0·39
138	21·55621	"	4175·60	·418	·749	·533	·803	− 0·13
139	21·55931	"	4175·37	·418	·736	·532	·803	+ 0·38
142	21·58012	"	4173·77	·417	·674	·529	·801	+ 0·02
128	Oct. 21·53078	+ 22·368 D.	3826·15	+ 0·383 s	− 0·864 π	− 0·684 α	+ 0·668 δ	= − 0·19
129	21·53368	"	3826·84	·383	·856	·684	·667	− 0·47
132	21·54233	"	3828·92	·383	·838	·685	·666	− 0·97
133	21·54413	"	3829·35	·383	·828	·685	·666	− 0·73
136	21·55192	"	3831·25	·383	·810	·686	·665	− 0·87
137	21·55365	"	3831·67	·383	·800	·686	·665	− 0·38
140	21·57522	"	3837·01	·384	·733	·688	·662	− 0·81
141	21·57720	"	3837·50	·384	·727	·689	·661	− 0·49

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
143	Oct. 21·59862	+ 24·376 D.	5899·17	+ 0·590 s	− 0·180 π	− 0·738 α	− 0·597 δ	= − 0·55
146	21·61798	,,	5913·71	·591	·141	·738	·596	− 0·26
147	21·62318	,,	5917·63	·592	·125	·738	·596	− 0·46
150	21·63841	,,	5929·16	·593	·079	·738	·596	− 0·46
144	Oct. 21·60836	+ 22·354 D.	1775·77	+ 0·178 s	+ 0·272 π	+ 0·832 α	+ 0·426 δ	= − 0·15
145	21·61217	,,	1772·88	·177	·272	·832	·426	− 0·15
148	21·62893	,,	1760·16	·176	·210	·832	·425	+ 0·15
149	21·63278	,,	1757·24	·176	·210	·832	·425	− 0·11
151	Oct. 21·84911	+ 22·354 D.	1590·51	+ 0·159 s	− 0·695 π	+ 0·835 α	+ 0·417 δ	= + 0·04
154	21·86785	,,	1576·18	·158	·751	·835	·416	+ 0·19
155	21·87453	,,	1571·09	·157	·777	·835	·416	+ 0·05
158	21·89395	,,	1556·33	·156	·831	·836	·414	+ 0·09
152	Oct. 21·85579	+ 24·376 D.	6096·20	+ 0·610 s	+ 0·727 π	− 0·740 α	− 0·594 δ	= − 0·43
153	21·86138	,,	6100·49	·610	·743	·740	·594	− 0·10
156	21·88043	,,	6115·06	·612	·807	·740	·593	− 0·63
157	21·88482	,,	6118·41	·612	·821	·740	·593	+ 0·23
161	Oct. 24·53968	+ 22·354 D.	504·34	+ 0·050 s	+ 0·045 π	− 0·489 α	− 0·848 δ	= − 0·06
163	24·54393	,,	507·35	·051	·043	·491	·847	+ 0·08
165	24·55510	,,	515·28	·051	·037	·497	·842	− 0·34
167	24·55974	,,	518·58	·052	·036	·500	·841	− 0·04
169	24·56342	,,	521·22	·052	·036	·502	·840	− 0·10
171	24·56702	,,	523·80	·052	·035	·504	·838	+ 0·23
			° ′ ″					″ ″
162	Oct. 24·53981	+ 22·354 P.A.	212 5 30	+ 0·050 p	− 0·822 π	− 0·780 α	+ 0·531 δ	= + 13 = + 0·03
164	24·54389	,,	212 15 24	·051	·812	·779	·533	+ 88 + 0·22
166	24·55500	,,	212 41 55	·051	·776	·775	·539	−125 − 0·31
168	24·55957	,,	212 52 39	·052	·761	·773	·542	− 1 − 0·00
170	24·56355	,,	213 1 54	·052	·750	·772	·544	− 52 − 0·13
172	24·56711	,,	213 10 6	·052	·739	·772	·546	+ 39 + 0·10
			″		″			
159	Oct. 24·5	Stands. D.	6521·85	+ 0·652 s	= + 0·43			
173	24·6	,, D.	,,	·652	+ 0·09	″		
160	24·5	,, P.A.	45° 56′ 17″	·652 p	+ 3	= + 0·10		
174	24·6	,, P.A.	,,	·652	− 27	− 0·86		
			″					″
175	Oct. 24·86691	+ 22·354 D.	752·86	+ 0·075 s	+ 0·777 π	− 0·606 α	− 0·754 δ	= + 0·43
177	24·87117	,,	756·20	·076	·792	·607	·752	+ 0·09
179	24·87601	,,	760·00	·076	·807	·608	·751	+ 0·54
181	24·88012	,,	763·22	·076	·820	·609	·751	+ 0·30
185	24·90032	,,	779·04	·078	·872	·612	·747	− 0·15
187	24·90441	,,	782·23	·078	·884	·613	·746	+ 0·17
189	24·90963	,,	786·31	·079	·896	·614	·745	− 0·15
191	24·91456	,,	790·15	·079	·907	·615	·744	− 0·06

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
176	Oct. 24·86705	+22·354 P.A.	221 11 3	+ 0·075 p	+ 0·188 π	− 0·693 α	+ 0·656 δ	= −194	= − 0·70
178	24·87123	„	221 15 5	·076	·190	·693	·659	− 29	− 0·11
180	24·87612	„	221 20 6	·076	·194	·692	·660	−180	− 0·66
182	24·88017	„	221 24 3	·076	·196	·692	·661	+ 11	+ 0·04
186	24·90049	„	221 43 7	·078	·197	·688	·665	− 8	− 0·03
188	24·90448	„	221 46 43	·078	·196	·687	·666	− 72	− 0·27
190	24·90957	„	221 51 17	·079	·195	·686	·667	− 52	− 0·20
192	24·91467	„	221 55 42	·079	·194	·685	·668	+ 15	+ 0·06
			″		″				
183	Oct. 24·9	Stands. D.	6521·85	+ 0·652 s	= + 0·08				
184	24·9	„ P.A.	45° 56′ 17″	·652 p	− 24	= − 0·76			
			″					″	
197	Oct. 25·53427	+22·354 D.	1258·08	+ 0·126 s	− 0·171 π	− 0·675 α	− 0·680 δ	= + 0·39	
198	25·53579	„	1259·30	·126	·170	·675	·680	+ 0·26	
203	25·54710	„	1268·24	·127	·166	·677	·679	+ 0·81	
204	25·54939	„	1270·06	·127	·160	·677	·679	+ 0·74	
			° ′ ″						″
193	Oct. 25·52038	+22·354 P.A.	227 2 56	+ 0·127 p	− 0·855 π	− 0·629 α	+ 0·731 δ	= −54	= − 0·33
196	25·53107	„	227 7 36	·128	·828	·628	·732	−21	− 0·13
205	25·55240	„	227 16 45	·128	·769	·626	·734	−31	− 0·19
208	25·56297	„	227 21 12	·128	·738	·625	·735	−53	− 0·33
			″						
199	Oct. 25·53911	+22·347 D.	1571·50	+ 0·157 s	+ 0·068 π	+ 0·626 α	+ 0·815 δ	= − 0·91	
200	25·54052	„	1570·46	·157	·068	·626	·815	− 0·48	
201	25·54252	„	1568·97	·157	·068	·626	·815	− 0·14	
202	25·54458	„	1567·44	·157	·065	·625	·815	− 0·13	
			° ′ ″						″
194	Oct. 25·52360	+22·347 P.A.	35 33 24	+ 0·156 p	+ 0·864 π	+ 0·750 α	− 0·582 δ	= −21	= − 0·16
195	25·52717	„	35 30 59	·156	·854	·751	·581	−55	− 0·42
206	25·55632	„	35 10 43	·155	·769	·753	·576	−13	− 0·10
207	25·55876	„	35 9 0	·155	·753	·753	·575	+ 1	+ 0·01
			″						
209	Oct. 25·85384	+22·354 D.	1519·10	+ 0·152 s	+ 0·769 π	− 0·696 α	− 0·656 δ	= + 0·54	
215	25·87001	„	1532·97	·153	·822	·697	·655	+ 0·41	
217	25·87502	„	1536·49	·154	·836	·697	·655	+ 0·38	
			° ′ ″						″
210	Oct. 25·85385	+22·354 P.A.	229 2 37	+ 0·152 p	+ 0·072 π	− 0·605 α	+ 0·755 δ	= −80	= − 0·59
216	25·87003	„	229 6 4	·153	·081	·604	·756	−23	− 0·17
218	25·87502	„	229 7 40	·154	·082	·604	·756	−52	− 0·38
			″						
211	Oct. 25·85982	+22·347 D.	1329·86	+ 0·133 s	− 0·728 π	+ 0·474 α	+ 0·857 δ	= − 0·16	
213	25·86558	„	1325·56	·133	·742	·473	·858	− 0·30	
219	25·88076	„	1314·25	·131	·779	·469	·860	− 0·02	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
212	Oct. 25·85987	+ 22·347 P.A.	30 57 4	+ 0·133 p	− 0·317 π	+ 0·790 α	− 0·514 δ	= −130	= − 0·84
214	25·86570	,,	30 51 40	·133	·326	·791	·513	− 59	− 0·38
220	25·88083	,,	30 37 37	·131	·348	·792	·509	− 54	− 0·35
			″					″	
221	Oct. 28·61545	+ 22·331 D.	4158·13	+ 0·416 s	+ 0·499 π	+ 0·809 α	− 0·485 δ	= − 0·04	
224	28·62459	,,	4154·58	·416	·461	·808	·487	+ 0·47	
225	28·63122	,,	4151·99	·415	·441	·808	·488	− 0·26	
228	28·64274	,,	4147·53	·415	·398	·807	·489	− 0·43	
229	28·64509	,,	4146·61	·415	·376	·807	·489	+ 0·29	
232	28·65456	,,	4142·96	·414	·332	·806	·491	− 0·16	
222	Oct. 28·61888	+ 20·404 D.	5457·91	+ 0·546 s	− 0·499 π	− 0·522 α	+ 0·825 δ	= + 0·12	
223	28·62120	,,	5457·98	·546	·494	·523	·825	+ 0·31	
226	28·63559	,,	5458·41	·546	·451	·524	·823	− 0·83	
227	28·63856	,,	5458·50	·546	·439	·524	·823	+ 0·19	
230	28·64841	,,	5458·81	·546	·408	·525	·823	− 0·60	
231	28·65071	,,	5458·88	·546	·403	·526	·822	+ 0·17	
233	Oct. 29·51346	+ 22·331 D.	3909·65	+ 0·391 s	+ 0·860 π	+ 0·711 α	− 0·638 δ	= + 0·31	
236	29·52092	,,	3907·91	·391	·841	·710	·639	+ 0·30	
237	29·52323	,,	3907·18	·391	·831	·710	·640	− 0·64	
240	29·53071	,,	3905·37	·391	·811	·709	·641	− 0·19	
241	29·53313	,,	3904·79	·390	·801	·709	·642	− 0·11	
244	29·53954	,,	3903·27	·390	·780	·708	·642	− 0·58	
234	Oct. 29·51606	+ 20·404 D.	5499·49	+ 0·550 s	− 0·837 π	− 0·625 α	+ 0·737 δ	= − 0·38	
235	29·51792	,,	5499·73	·550	·833	·625	·737	− 0·91	
238	29·52631	,,	5500·83	·550	·811	·626	·736	− 0·10	
239	29·52814	,,	5501·07	·550	·798	·626	·736	− 0·50	
242	29·53549	,,	5502·05	·550	·782	·627	·735	− 0·58	
243	29·53731	,,	5502·29	·550	·776	·627	·735	− 0·76	
245	Oct. 29·54873	+ 22·347 D.	1872·65	+ 0·187 s	− 0·440 π	− 0·881 α	− 0·305 δ	= + 0·29	
248	29·56508	,,	1886·05	·189	·397	·880	·306	− 0·11	
249	29·56986	,,	1889·98	·189	·382	·880	·307	+ 0·33	
252	29·58649	,,	1903·70	·190	·334	·880	·308	− 0·11	
246	Oct. 29·55482	+ 21·321 D.	5991·51	+ 0·599 s	+ 0·290 π	+ 0·800 α	+ 0·501 δ	= + 0·55	
247	29·55954	,,	5987·50	·599	·279	·800	·501	+ 0·76	
250	29·57495	,,	5974·38	·597	·242	·800	·501	+ 0·34	
251	29·57953	,,	5970·47	·597	·230	·800	·501	+ 0·81	
253	Oct. 29·81867	+ 22·347 D.	2098·75	+ 0·210 s	+ 0·679 π	− 0·872 α	− 0·335 δ	= − 0·26	
256	29·83932	,,	2116·01	·212	·749	·870	·337	− 0·17	
257	29·84557	,,	2121·22	·212	·765	·870	·338	+ 0·05	
260	29·86485	,,	2137·24	·214	·823	·870	·339	− 0·31	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
254	Oct. 29·82744	+ 21·321 D.	5755·40	+ 0·576 s	− 0·731 π	+ 0·802 α	+ 0·499 δ	= + 0·59
255	29·83236	„	5751·15	·575	·743	·802	·499	+ 0·95
258	29·85249	„	5733·82	·573	·807	·802	·499	+ 0·21
259	29·85726	„	5729·72	·573	·827	·802	·498	+ 0·81
261	Oct. 30·51461	+ 20·404 D.	5659·60	+ 0·566 s	− 0·847 π	− 0·719 α	+ 0·630 δ	= − 0·49
264	30·52245	„	5661·52	·566	·833	·720	·629	+ 0·15
265	30·52608	„	5662·42	·566	·817	·720	·628	− 0·18
268	30·53452	„	5664·52	·566	·788	·720	·627	− 0·40
269	30·53680	„	5665·10	·566	·786	·721	·627	− 0·59
272	30·54391	„	5666·89	·567	·760	·721	·625	− 0·54
262	Oct. 30·51752	+ 22·331 D.	3790·58	+ 0·379 s	+ 0·809 π	+ 0·570 α	− 0·788 δ	= + 0·02
263	30·51971	„	3790·47	·379	·801	·570	·788	+ 0·08
266	30·52951	„	3789·97	·379	·773	·569	·790	+ 0·27
267	30·53152	„	3789·87	·379	·770	·569	·790	− 0·13
270	30·53970	„	3789·47	·379	·744	·568	·796	− 0·30
271	30·54136	„	3789·39	·379	·740	·567	·792	− 0·32
273	Oct. 30·55352	+ 21·321 D.	5163·09	+ 0·516 s	+ 0·297 π	+ 0·809 α	+ 0·487 δ	= + 0·13
276	30·56827	„	5150·49	·515	·257	·809	·487	+ 1·05
277	30·57314	„	5146·32	·515	·248	·809	·487	+ 0·58
280	30·58603	„	5135·25	·514	·215	·809	·487	+ 0·14
274	Oct. 30·55925	+ 22·347 D.	2687·96	+ 0·269 s	− 0·344 π	− 0·850 α	− 0·396 δ	= + 0·14
275	30·56252	„	2690·71	·269	·338	·849	·397	+ 0·53
278	30·57764	„	2703·50	·270	·296	·849	·397	+ 0·07
279	30·58106	„	2706·40	·271	·286	·849	·397	+ 0·10
281	Oct. 30·81779	+ 22·347 D.	2910·04	+ 0·291 s	+ 0·696 π	− 0·845 α	− 0·411 δ	= + 0·30
284	30·83617	„	2925·75	·293	·758	·845	·412	+ 0·13
285	30·84598	„	2934·12	·293	·791	·844	·413	+ 0·24
288	30·86257	„	2948·21	·295	·835	·844	·413	+ 0·18
282	Oct. 30·82630	+ 21·321 D.	4926·03	+ 0·493 s	− 0·735 π	+ 0·811 α	+ 0·483 δ	= + 0·18
283	30·83071	„	4922·21	·492	·752	·811	·483	+ 0·09
286	30·85145	„	4904·32	·490	·816	·811	·482	+ 0·00
287	30·85581	„	4900·57	·490	·830	·811	·482	+ 0·02
289	Oct. 31·50438	+ 22·329 D.	4364·23	+ 0·436 s	+ 0·869 π	+ 0·755 α	− 0·579 δ	= + 0·16
292	31·51267	„	4361·89	·436	·855	·754	·581	+ 0·17
293	31·51498	„	4361·24	·436	·841	·754	·582	+ 0·15
296	31·52240	„	4359·17	·436	·826	·753	·584	+ 0·09
297	31·52411	„	4358·69	·436	·811	·753	·584	− 0·53
300	31·53153	„	4356·63	·436	·795	·752	·585	+ 0·32

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
290	Oct. 31·50756	+ 20·404 D.	5926·43	+ 0·593 s	− 0·861 π	− 0·793 α	+ 0·518 δ	= − 0·64
291	31·51008	,,	5927·30	·593	·852	·793	·518	+ 0·00
294	31·51722	,,	5929·78	·593	·832	·794	·517	− 0·44
295	31·51982	,,	5930·68	·593	·823	·794	·516	+ 0·05
298	31·52703	,,	5933·22	·593	·802	·794	·515	− 0·16
299	31·52951	,,	5934·09	·593	·792	·794	·515	− 0·17
301	Oct. 31·53947	+ 22·347 D.	3494·44	+ 0·349 s	− 0·349 π	− 0·830 α	− 0·445 δ	= + 0·30
304	31·55657	,,	3508·99	·351	·314	·830	·445	+ 0·21
305	31·56120	,,	3512·94	·351	·302	·830	·446	+ 0·17
308	31·57421	,,	3524·07	·352	·261	·830	·447	− 0·13
302	Oct. 31·54865	+ 21·321 D.	4336·32	+ 0·434 s	+ 0·312 π	+ 0·820 α	+ 0·465 δ	= + 0·72
303	31·55220	,,	4333·29	·433	·312	·820	·465	+ 0·80
306	31·56641	,,	4321·15	·432	·275	·821	·465	− 0·05
307	31·56931	,,	4318·67	·432	·263	·821	·464	+ 0·45
309	Oct. 31·84219	+ 21·321 D.	4081·50	+ 0·408 s	− 0·807 π	+ 0·824 α	+ 0·457 δ	= ...
309*a*	31·84624	,,	4078·03	·408	·809	·824	·457	...
312	31·86321	,,	4063·47	·406	·859	·825	·457	+ 0·38
				309 and 309*a* are not Iris and + 21°·321.				
310	Oct. 31·85159	+ 22·347 D.	3764·96	+ 0·377 s	+ 0·823 π	− 0·825 α	− 0·455 δ	= + 0·43
311	31·85590	,,	3768·66	·377	·837	·825	·456	− 0·21
313	Nov. 1·50985	+ 22·329 D.	4192·45	+ 0·419 s	+ 0·831 π	+ 0·638 α	− 0·726 δ	= + 0·48
316	1·52404	,,	4190·88	·419	·787	·636	·728	+ 0·60
317	1·52772	,,	4190·47	·419	·782	·635	·728	+ 0·86
320	1·53626	,,	4189·51	·419	·757	·634	·730	− 0·78
321	1·53914	,,	4189·18	·419	·741	·634	·730	− 0·17
324	1·54764	,,	4188·24	·419	·719	·633	·732	− 0·56
314	Nov. 1·51492	+ 20·388 D.	3444·71	+ 0·344 s	− 0·689 π	− 0·317 α	+ 0·941 δ	= − 0·40
315	1·51912	,,	3443·75	·344	·677	·318	·940	+ 0·22
318	1·53090	,,	3441·08	·344	·655	·320	·939	− 0·25
319	1·53325	,,	3440·55	·344	·648	·321	·939	− 0·49
322	1·54263	,,	3438·45	·344	·632	·323	·938	− 0·62
323	1·54514	,,	3437·89	·344	·621	·324	·937	− 0·45
325	Nov. 1·55857	+ 22·347 D.	4342·14	+ 0·434 s	− 0·271 π	− 0·816 α	− 0·478 δ	= + 0·72
328	1·57581	,,	4357·01	·436	·230	·815	·478	+ 0·66

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
326	Nov. 1·56503	+ 21·321 D.	3494·35	+ 0·349 s	+ 0·291 π	+ 0·838 α	+ 0·429 δ	= + 0·38
327	1·56949	„	3490·55	·349	·277	·839	·429	+ 0·09
329	Nov. 1·81910	+ 21·321 D.	3274·95	+ 0·328 s	− 0·734 π	+ 0·843 α	+ 0·418 δ	= + 0·63
332	1·84018	„	3256·93	·326	·798	·844	·417	− 0·04
333	1·84688	„	3251·24	·325	·813	·844	·416	− 0·10
336	1·87030	„	3231·38	·323	·879	·844	·415	+ 0·45
330	Nov. 1·82708	+ 22·347 D.	4576·54	+ 0·458 s	+ 0·766 π	− 0·813 α	− 0·484 δ	= + 0·33
331	1·83278	„	4581·48	·458	·787	·813	·484	+ 0·09
334	1·85364	„	4599·52	·460	·846	·812	·484	+ 0·42
335	1·85986	„	4604·88	·461	·864	·812	·484	+ 0·89
337	Nov. 2·49012	+ 22·329 D.	4195·08	+ 0·420 s	+ 0·828 π	+ 0·494 α	− 0·847 δ	= + 0·47
340	2·51244	„	4196·57	·420	·776	·491	·849	− 0·48
341	2·51675	„	4196·86	·420	·764	·490	·849	− 0·01
344	2·53176	„	4197·87	·420	·730	·488	·851	− 0·55
338	Nov. 2·49861	+ 20·388 D.	3288·87	+ 0·329 s	− 0·812 π	− 0·518 α	+ 0·830 δ	= − 0·39
339	2·50387	„	3288·70	·329	·804	·519	·829	− 0·82
342	2·52267	„	3288·14	·329	·766	·523	·828	− 0·04
343	2·52748	„	3288·02	·329	·752	·524	·826	+ 0·99
345	Nov. 3·49284	+ 21·317 D.	3424·06	+ 0·342 s	+ 0·880 π	+ 0·701 α	− 0·657 δ	= + 0·75
348	3·49918	„	3422·96	·342	·852	·700	·658	+ 0·31
349	3·50120	„	3422·61	·342	·852	·699	·659	− 0·05
352	3·50702	„	3421·60	·342	·833	·698	·660	− 0·27
353	3·51095	„	3420·92	·342	·824	·698	·660	− 0·38
356	3·51652	„	3419·97	·342	·810	·697	·661	+ 0·12
357	3·51893	„	3419·56	·342	·795	·696	·662	− 0·40
360	3·52497	„	3418·53	·342	·780	·695	·663	− 0·03
346	Nov. 3·49544	+ 20·388 D.	3332·48	+ 0·333 s	− 0·867 π	− 0·697 α	+ 0·662 δ	= − 0·37
347	3·49698	„	3332·74	·333	·862	·698	·662	+ 0·22
350	3·50310	„	3333·81	·333	·844	·698	·661	+ 0·07
351	3·50471	„	3334·09	·333	·839	·698	·660	+ 0·18
354	3·51303	„	3335·56	·334	·816	·699	·658	− 0·10
355	3·51460	„	3335·84	·334	·811	·700	·658	+ 0·21
358	3·52124	„	3337·03	·334	·796	·701	·657	+ 0·14
359	3·52267	„	3337·30	·334	·791	·701	·657	+ 0·07
361	Nov. 3·53300	+ 22·347 D.	5991·77	+ 0·599 s	− 0·281 π	− 0·795 α	− 0·518 δ	= + 1·17
364	3·54907	„	6005·57	·601	·247	·795	·518	+ 0·83
365	3·55348	„	6009·36	·601	·239	·795	·518	+ 1·34
368	3·56807	„	6021·92	·602	·222	·795	·518	+ 1·06

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
362	Nov. 3·54093	+ 21·321 D.	1905·60	+ 0·190 s	+ 0·456 π	+ 0·901 α	+ 0·245 δ	= − 0·52
363	3·54413	,,	1903·05	·190	·442	·901	·244	− 0·50
366	3·55909	,,	1891·21	·189	·397	·902	·243	− 0·59
367	3·56238	,,	1888·63	·189	·391	·902	·242	− 0·99
369	Nov. 3·82106	+ 22·347 D.	6242·87	+ 0·624 s	+ 0·752 π	− 0·793 α	− 0·522 δ	= + 1·22
372	3·82543	,,	6246·68	·625	·768	·793	·522	+ 0·91
373	3·84355	,,	6262·43	·626	·826	·793	·522	+ 0·67
376	3·84761	,,	6265·97	·627	·837	·793	·522	+ 0·80
377	Nov. 7·48186	+ 21·304 D.	4883·03	+ 0·488 s	+ 0·791 π	+ 0·454 α	− 0·874 δ	= + 0·29
380	7·48942	,,	4884·22	·488	·771	·453	·875	+ 0·01
381	7·49210	,,	4884·64	·488	·765	·452	·875	+ 0·22
384	7·49841	,,	4885·64	·489	·749	·451	·876	+ 0·11
385	7·49985	,,	4885·87	·489	·745	·451	·876	+ 0·13
388	7·50637	,,	4886·90	·489	·731	·450	·876	+ 0·09
389	7·50924	,,	4887·35	·489	·718	·449	·876	+ 0·02
392	7·51492	,,	4888·25	·489	·705	·448	·877	− 0·01
378	Nov. 7·48481	+ 19·340 D.	5549·17	+ 0·555 s	− 0·552 π	− 0·057 α	+ 0·998 δ	= + 0·23
379	7·48667	,,	5548·26	·555	·549	·058	·998	− 0·25
382	7·49449	,,	5544·42	·554	·536	·058	·998	− 0·41
383	7·49621	,,	5543·58	·554	·534	·059	·998	− 0·04
386	7·50194	,,	5540·77	·554	·526	·059	·998	− 0·51
387	7·50390	,,	5539·81	·554	·523	·059	·998	− 0·17
390	7·51099	,,	5536·34	·554	·512	·060	·998	− 0·35
391	7·51244	,,	5535·63	·554	·510	·061	·998	+ 0·09
393	Nov. 7·52369	+ 20·388 D.	5076·84	+ 0·508 s	− 0·595 π	+ 0·934 α	+ 0·008 δ	= + 0·54
396	7·53917	,,	5086·82	·509	·539	·934	·006	+ 0·60
397	7·54406	,,	5089·99	·509	·521	·934	·006	+ 0·49
400	7·58511	,,	5116·81	·512	·355	·934	·001	+ 0·97
394	Nov. 7·53023	+ 20·341 D.	5349·58	+ 0·535 s	+ 0·550 π	+ 0·933 α	+ 0·044 δ	= − 1·00
395	7·53335	,,	5347·49	·535	·539	·933	·044	− 0·96
398	7·55092	,,	5335·75	·534	·481	·933	·042	− 0·44
399	7·55533	,,	5332·79	·533	·462	·933	·041	− 1·19
401	Nov. 10·76809	+ 20·341 D.	3770·76	+ 0·377 s	− 0·292 π	+ 0·854 α	− 0·410 δ	= − 1·03
404	10·77822	,,	3767·63	·377	·317	·853	·412	− 0·73
405	10·78035	,,	3766·98	·377	·325	·853	·412	− 1·23
408	10·78858	,,	3764·47	·376	·339	·852	·414	− 0·56

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
402	Nov.10·77127	+ 19·340 D.	4383·03	+ 0·438 s	− 0·096 π	− 0·490 α	+ 0·852 δ	= + 0·00
403	10·77308	,,	4382·73	·438	·093	·490	·852	− 0·29
406	10·78329	,,	4381·04	·438	·085	·491	·851	+ 0·43
407	10·78540	,,	4380·69	·438	·083	·492	·850	− 0·10
409	Nov.11·46454	+ 20·341 D.	3624·60	+ 0·362 s	+ 0·873 π	+ 0·794 α	− 0·532 δ	= − 0·82
412	11·47400	,,	3622·76	·362	·848	·793	·534	− 1·31
413	11·47602	,,	3622·37	·362	·844	·792	·534	− 1·30
416	11·48276	,,	3621·07	·362	·826	·792	·535	− 1·18
417	11·48441	,,	3620·75	·362	·821	·791	·535	− 0·88
420	11·49124	,,	3619·43	·362	·803	·791	·537	− 0·79
421	11·49298	,,	3619·09	·362	·796	·791	·537	− 0·88
424	11·49832	,,	3618·07	·362	·785	·790	·539	− 0·35
410	Nov.11·46690	+ 19·340 D.	4283·77	+ 0·428 s	− 0·845 π	− 0·584 α	+ 0·782 δ	= − 0·51
411	11·47159	,,	4283·47	·428	·834	·585	·782	+ 0·21
414	11·47856	,,	4283·04	·428	·815	·586	·781	+ 0·47
415	11·48000	,,	4282·95	·428	·810	·586	·781	− 0·03
418	11·48740	,,	4282·52	·428	·792	·586	·780	− 0·31
419	11·48911	,,	4282·42	·428	·783	·587	·780	− 0·04
422	11·49498	,,	4282·08	·428	·769	·587	·779	+ 0·32
423	11·49630	,,	4282·00	·428	·767	·588	·778	+ 0·16
425	Nov.11·75272	+ 20·341 D.	3573·43	+ 0·357 s	− 0·137 π	+ 0·761 α	− 0·583 δ	= − 0·82
428	11·75991	,,	3572·41	·357	·153	·760	·585	− 0·79
429	11·76201	,,	3572·14	·357	·157	·760	·585	− 0·61
432	11·76801	,,	3571·32	·357	·167	·759	·587	− 1·16
426	Nov.11·75544	+ 19·340 D.	4272·19	+ 0·427 s	+ 0·003 π	− 0·622 α	+ 0·747 δ	= + 0·02
427	11·75745	,,	4272·13	·427	·005	·623	·747	+ 0·06
430	11·76411	,,	4271·91	·427	·018	·623	·746	+ 0·01
431	11·76553	,,	4271·86	·427	·019	·624	·746	+ 0·06
433	Nov.12·50900	+ 20·341 D.	3544·57	+ 0·354 s	+ 0·729 π	+ 0·664 α	− 0·706 δ	= − 0·34
436	12·53168	,,	3544·27	·354	·660	·661	·709	− 0·63
437	12·53502	,,	3544·24	·354	·647	·660	·710	− 0·84
440	12·56460	,,	3543·94	·354	·543	·657	·714	− 0·33
441	12·56824	,,	3543·91	·354	·531	·656	·715	− 0·30
444	12·57584	,,	3543·86	·354	·507	·655	·716	− 0·67

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No.	Date. 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
434	Nov.12·51565	+ 19·340 D.	4262·55	+ 0·426 s	− 0·717 π	− 0·712 α	+ 0·651 δ	= + 0·20
435	12·51921	,,	4262·82	·426	·701	·713	·651	+ 0·21
438	12·54127	,,	4264·59	·426	·632	·715	·647	+ 0·26
439	12·55185	,,	4265·47	·427	·595	·716	·646	+ 0·31
442	12·57016	,,	4267·06	·427	·521	·719	·643	+ 0·08
443	12·57350	,,	4267·35	·427	·509	·719	·643	− 0·28
445	Nov.12·76232	+ 20·341 D.	3547·15	+ 0·355 s	− 0·022 π	+ 0·627 α	− 0·744 δ	= − 0·79
448	12·76904	,,	3547·48	·355	·032	·625	·745	− 0·51
449	12·77098	,,	3547·58	·355	·032	·625	·745	− 0·55
452	12·77718	,,	3547·88	·355	·036	·624	·747	− 0·24
446	Nov.12·76480	+ 19·340 D.	4285·76	+ 0·429 s	+ 0·144 π	− 0·739 α	+ 0·616 δ	= − 0·01
447	12·76636	,,	4285·90	·429	·145	·740	·615	+ 0·37
450	12·77314	,,	4286·54	·429	·162	·740	·615	+ 0·51
451	12·77481	,,	4286·70	·429	·165	·740	·614	+ 0·47
453	Nov.13·46164	+ 20·341 D.	3639·38	+ 0·364 s	+ 0·818 π	+ 0·522 α	− 0·831 δ	= − 0·51
456	13·46935	,,	3640·55	·364	·794	·520	·832	− 0·78
457	13·47186	,,	3640·93	·364	·790	·520	·832	− 0·85
460	13·47780	,,	3641·83	·364	·776	·519	·833	− 0·85
461	13·47971	,,	3642·12	·364	·768	·519	·833	− 1·02
464	13·48538	,,	3642·99	·364	·755	·518	·834	+ 0·12
454	Nov.13·46456	+ 19·340 D.	4354·61	+ 0·436 s	− 0·852 π	− 0·803 α	+ 0·517 δ	= + 0·76
455	13·46672	,,	4355·00	·436	·847	·804	·517	+ 0·98
458	13·47413	,,	4356·33	·436	·828	·804	·516	+ 0·84
459	13·47554	,,	4356·58	·436	·824	·804	·515	+ 0·93
462	13·48196	,,	4357·75	·436	·810	·805	·515	+ 0·95
463	13·48348	,,	4358·03	·436	·800	·805	·515	+ 0·80
465	Nov.13·49323	+ 19·340 D.	4359·83	+ 0·436 s	− 0·771 π	− 0·806 α	+ 0·514 δ	= + 0·93
468	13·50946	,,	4362·89	·436	·715	·807	·511	+ 0·91
469	13·51524	,,	4364·00	·436	·698	·807	·510	+ 1·03
472	13·52847	,,	4366·55	·437	·656	·808	·508	+ 0·71
466	Nov.13·50036	+ 19·324 D.	6268·04	+ 0·627 s	+ 0·609 π	+ 0·938 α	− 0·031 δ	= + 0·16
467	13·50461	,,	6265·84	·626	·594	·938	·031	− 0·30
470	13·51962	,,	6258·09	·626	·544	·938	·033	− 0·39
471	13·52349	,,	6256·08	·626	·532	·938	·033	− 0·48
473	Nov.13·77692	+ 19·324 D.	6125·22	+ 0·612 s	− 0·542 π	+ 0·938 α	− 0·056 δ	= − 0·45
476	13·79959	,,	6114·09	·611	·611	·938	·058	+ 0·93
477	13·80691	,,	6110·53	·611	·623	·938	·059	+ 0·02
480	13·83260	,,	6098·19	·610	·678	·937	·062	+ 0·18

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
474	Nov. 13·78049	+ 19·340 D.	4419·55	+ 0·442 s	+ 0·299 π	− 0·828 α	+ 0·470 δ	= + 1·35
475	13·79007	,,	4421·52	·442	·321	·829	·469	+ 0·32
478	13·81724	,,	4427·03	·443	·363	·831	·465	+ 0·13
479	13·82267	,,	4428·13	·443	·372	·831	·464	+ 0·62
481	Nov. 14·45624	+ 20·341 D.	3884·10	+ 0·388 s	+ 0·755 π	+ 0·371 α	− 0·918 δ	= − 0·61
484	14·46309	,,	3886·10	·388	·737	·371	·919	− 1·10
485	14·46561	,,	3886·81	·389	·732	·370	·919	− 0·50
488	14·47227	,,	3888·75	·389	·721	·370	·919	− 0·32
489	14·47439	,,	3889·36	·389	·710	·369	·919	− 0·69
492	14·48140	,,	3891·41	·389	·698	·368	·920	− 0·84
493	14·48344	,,	3892·00	·389	·691	·367	·920	− 0·45
496	14·48986	,,	3893·87	·389	·675	·366	·921	− 0·33
482	Nov. 14·45896	+ 18·283 D.	2833·76	+ 0·283 s	− 0·655 π	− 0·205 α	+ 0·976 δ	= + 0·45
483	14·46066	,,	2833·06	·283	·652	·206	·975	+ 0·46
486	14·46806	,,	2830·06	·283	·640	·207	·975	+ 0·33
487	14·46965	,,	2829·42	·283	·634	·208	·975	− 0·28
490	14·47636	,,	2826·71	·283	·625	·209	·975	+ 0·18
491	14·47910	,,	2825·60	·283	·617	·210	·975	+ 0·11
494	14·48561	,,	2823·98	·282	·608	·211	·974	− 0·23
495	14·48722	,,	2822·33	·282	·605	·212	·974	+ 0·66
497	Nov. 14·49802	+ 19·324 D.	5822·64	+ 0·582 s	+ 0·659 π	+ 0·932 α	− 0·127 δ	= + 0·05
500	14·51447	,,	5815·41	·581	·587	·932	·128	+ 0·04
501	14·51842	,,	5813·67	·581	·569	·932	·129	+ 0·28
504	14·52991	,,	5808·60	·581	·533	·932	·130	− 0·56
498	Nov. 14·50458	+ 19·340 D.	4567·22	+ 0·457 s	− 0·695 π	− 0·874 α	+ 0·370 δ	= + 0·41
499	14·50900	,,	4568·47	·457	·677	·874	·368	+ 0·24
502	14·52261	,,	4572·38	·457	·630	·874	·367	+ 0·54
503	14·52530	,,	4573·16	·457	·622	·875	·366	0·00
505	Nov. 16·77532	+ 19·340 D.	5317·37	+ 0·532 s	+ 0·547 π	− 0·938 α	+ 0·086 δ	= + 0·42
508	16·79040	,,	5323·56	·532	·588	·938	·085	+ 0·45
509	16·79919	,,	5327·14	·533	·612	·938	·084	+ 0·61
512	16·81463	,,	5333·36	·533	·644	·939	·082	+ 0·73
506	Nov. 16·78151	+ 19·324 D.	5124·59	+ 0·513 s	− 0·377 π	+ 0·868 α	− 0·385 δ	= + 0·24
507	16·78542	,,	5123·78	·513	·386	·868	·385	+ 0·04
510	16·80588	,,	5119·64	·512	·419	·868	·388	− 0·06
511	16·80935	,,	5118·95	·512	·426	·868	·389	+ 0·19

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No.	Date. 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
513	Nov. 17·44751	+ 19·329 D.	2138·23	+ 0·214 s	+ 0·856 π	+ 0·687 α	− 0·684 δ	= − 0·51
516	17·45414	,,	2138·51	·214	·838	·685	·687	− 0·15
517	17·45584	,,	2138·58	·214	·834	·685	·687	− 0·26
520	17·46193	,,	2138·82	·214	·823	·684	·688	− 0·42
521	17·46383	,,	2138·90	·214	·814	·684	·689	− 0·52
524	17·46986	,,	2139·14	·214	·796	·682	·690	− 0·07
525	17·47272	,,	2139·26	·214	·786	·682	·690	− 0·53
528	17·47908	,,	2139·51	·214	·766	·680	·692	− 0·10
514	Nov. 17·44970	+ 18·283 D.	2279·44	+ 0·228 s	− 0·847 π	− 0·813 α	+ 0·506 δ	= + 0·65
515	17·45155	,,	2279·65	·228	·843	·813	·506	+ 0·50
518	17·45809	,,	2280·39	·228	·830	·815	·504	+ 0·70
519	17·45960	,,	2280·57	·228	·822	·815	·504	+ 0·70
522	17·46607	,,	2281·33	·228	·808	·816	·502	+ 0·58
523	17·46749	,,	2281·50	·228	·801	·817	·502	+ 0·29
526	17·47518	,,	2282·42	·228	·779	·817	·499	+ 0·69
527	17·47681	,,	2282·62	·228	·774	·818	·499	+ 0·24
529	Nov. 17·48839	+ 19·340 D.	5587·43	+ 0·559 s	− 0·588 π	− 0·943 α	+ 0·014 δ	= + 0·44
532	17·50300	,,	5593·85	·559	·543	·943	·013	+ 0·11
533	17·50880	,,	5596·39	·560	·517	·943	·012	+ 0·79
536	17·51939	,,	5601·00	·560	·475	·943	·011	+ 0·67
530	Nov. 17·49409	+ 19·324 D.	5028·89	+ 0·503 s	+ 0·712 π	+ 0·834 α	− 0·467 δ	= − 0·34
531	17·49739	,,	5028·38	·503	·706	·833	·468	+ 0·34
534	17·51296	,,	5026·05	·502	·648	·833	·469	− 0·74
535	17·51530	,,	5025·71	·502	·642	·832	·470	− 0·17
537	Nov. 17·76271	+ 19·324 D.	4992·94	+ 0·499 s	− 0·259 π	+ 0·817 α	− 0·499 δ	= − 0·10
540	17·77631	,,	4991·56	·499	·282	·818	·501	− 0·36
541	17·78140	,,	4991·07	·499	·291	·818	·502	+ 0·26
544	17·79608	,,	4989·67	·499	·314	·819	·504	− 0·47
538	Nov. 17·76770	+ 19·340 D.	5713·22	+ 0·571 s	+ 0·577 π	− 0·943 α	− 0·012 δ	= + 0·15
539	17·77110	,,	5714·73	·571	·587	·943	·012	+ 0·14
542	17·78675	,,	5721·62	·572	·634	·943	·013	+ 0·92
543	17·79051	,,	5723·28	·572	·643	·943	·014	+ 0·69
547	Nov. 20·44782	+ 18·277 D.	338·77	+ 0·034 s	− 0·678 π	− 0·944 α	+ 0·038 δ	= − 0·02
549	20·45353	,,	340·70	·034	·658	·944	·028	+ 0·08
551	20·45769	,,	342·13	·034	·648	·945	·023	− 0·26
553	20·46274	,,	343·88	·034	·627	·945	·018	+ 0·55
555	20·46675	,,	345·30	·035	·615	·945	·013	+ 0·23
557	20·47174	,,	347·08	·035	·604	·945	·003	− 0·09

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
548	Nov.20·44775	+ 18·277 P.A.	272 5 35	+ 0·034 p	− 0·478 π	+ 0·035 α	+ 0·999 δ	= +197	= + 0·32
550	20·45350	,,	271 35 50	·034	·475	·027	·999	+117	+ 0·19
552	20·45762	,,	271 14 35	·034	·473	·021	1·000	+ 39	+ 0·06
554	20·46301	,,	270 47 39	·034	·471	·013	1·000	+648	+ 1·06
556	20·46679	,,	270 28 42	·035	·470	·007	1·000	+268	+ 0·45
558	20·47182	,,	270 3 32	·035	·470	·003	1·000	+382	+ 0·64
			″		″				
545	Nov. 20·4	Stands. D.	6522·14	+ 0·652 s	= − 0·16				
559	20·5	,, D.	,,	·652	− 0·21	″			
546	20·4	,, P.A.	45° 56′ 18″	·652 p	− 3	= − 0·10			
560	20·5	,, P.A.	,,	·652	− 15	− 0·48			
			″					″	
561	Nov.20·74704	+ 18·277 D.	469·94	+ 0·047 s	+ 0·637 π	− 0·902 α	− 0·297 δ	= − 0·25	
563	20·75213	,,	472·46	·047	·649	·901	·300	− 0·02	
567	20·76866	,,	480·67	·048	·718	·898	·316	+ 0·19	
569	20·77368	,,	483·17	·048	·728	·897	·319	− 0·03	
			° ′ ″					″	
562	Nov.20·74700	+ 18·277 P.A.	252 40 31	+ 0·047 p	− 0·267 π	− 0·278 α	+ 0·954 δ	= − 51	= − 0·12
564	20·75213	,,	252 25 55	·047	·264	·282	·953	+ 88	+ 0·20
568	20·76864	,,	251 39 48	·048	·258	·295	·949	+ 58	+ 0·13
570	20·77370	,,	251 25 52	·048	·257	·298	·948	+ 97	+ 0·22
			″		″				
565	Nov.20·8	Stands. D.	6522·14	+ 0·652 s	= − 0·32	″			
566	20·8	,, P.A.	45° 56′ 18″	·652 p	−23	= − 0·73			
			″					″	
573	Nov.21·44243	+ 18·277 D.	820·04	+ 0·082 s	− 0·222 π	− 0·757 α	− 0·601 δ	= − 0·18	
575	21·44817	,,	823·24	·082	·216	·756	·603	− 0·32	
577	21·45285	,,	825·84	·083	·211	·755	·603	+ 0·11	
579	21·45798	,,	828·71	·083	·206	·754	·605	− 0·29	
			° ′ ″					″	″
574	Nov.21·44246	+ 18·277 P.A.	233 2 6	+ 0·082 p	− 0·005 π	− 0·569 α	+ 0·800 δ	= + 100	= +0·40
576	21·44820	,,	232 57 23	·082	·006	·570	·798	+ 223	+0·88
578	21·45295	,,	232 53 32	·083	·006	·571	·798	+ 324	+1·28
580	21·45802	,,	232 49 29	·083	·007	·573	·796	+ 139	+0·55
			″						
571	Nov.21·4	Stands. D.	6522·15	+ 0·652 s	= − 0·63				
581	21·5	,, D.	,,	·652	− 0·35	″			
572	21·4	,, P.A.	45° 56′ 18″	·652 p	+ 5	= + 0·16			
582	21·5	,, P.A.	,,	·652	− 1	− 0·03			
			″					″	
583	Nov.21·74346	+ 18·277 D.	994·18	+ 0·099 s	+ 0·687 π	− 0·721 α	− 0·647 δ	= + 0·01	
585	21·74921	,,	997·52	·100	·708	·720	·649	+ 0·15	
589	21·76402	,,	1006·12	·101	·753	·719	·649	+ 0·13	
591	21·76902	,,	1009·01	·101	·768	·718	·651	+ 0·12	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
584	Nov.21·74336	+ 18·277 P.A.	229 38 2	+ 0·099 p	+ 0·003 π	− 0·612 α	+ 0·762 δ	= + 91	= +0·44
586	21·74906	,,	229 34 31	·100	·013	·614	·761	+ 40	+0·19
590	21·76396	,,	229 25 20	·101	·029	·615	·760	+ 90	+0·44
592	21·76896	,,	229 22 16	·101	·034	·616	·759	− 59	−0·29
			″		″				
587	Nov.21·8	Stands. D.	6522·15	+ 0·652 s	= − 0·44				
588	21·8	,, P.A.	45° 56′ 18″	·652 p	−16	= − 0·51			
			″					″	
595	Nov.22·43817	+ 18·277 D.	1368·95	+ 0·137 s	− 0·090 π	− 0·653 α	− 0·724 δ	= − 0·68	
597	22·44236	,,	1371·27	·137	·087	·653	·724	− 0·34	
599	22·44672	,,	1373·70	·137	·083	·652	·725	− 0·36	
601	22·45205	,,	1376·66	·138	·079	·652	·725	− 0·21	
603	22·45509	,,	1378·35	·138	·078	·652	·725	− 0·20	
605	22·46007	,,	1381·12	·138	·075	·652	·725	+ 0·34	
			° ′ ″					″	″
596	Nov.22·43828	+ 18·277 P.A.	223 37 10	+ 0·137 p	− 0·821 π	− 0·686 α	+ 0·690 δ	= + 150	= +1·00
598	22·44230	,,	223 35 59	·137	·812	·686	·690	+ 37	+0·24
600	22·44680	,,	223 34 40	·137	·803	·687	·689	− 128	−0·85
602	22·45209	,,	223 33 8	·138	·785	·687	·689	+ 85	+0·57
604	22·45512	,,	223 32 15	·138	·781	·687	·688	+ 112	+0·75
606	22·46013	,,	223 30 50	·138	·768	·687	·688	− 12	−0·08
			″		″				
593	Nov. 22·4·	Stands. D.	6522·16	+ 0·652 s	= − 0·24				
607	22·5·	,, D.	,,	·652	− 0·21				
594	22·4·	,, P.A.	45° 56′ 18″	·652 p	− 17	= − 0·54			
608	22·5·	,, P.A.	,,	·652	− 20	− 0·63			
			″					″	
609	Nov. 22·73847	+ 18·277 D.	1540·82	+ 0·154 s	+ 0·678 π	− 0·638 α	− 0·739 δ	= − 0·46	
611	22·74405	,,	1544·02	·154	·692	·637	·740	− 0·15	
615	22·75886	,,	1552·50	·155	·735	·637	·740	− 0·06	
617	22·76419	,,	1555·55	·156	·748	·637	·741	− 0·24	
			° ′ ″					″	″
610	Nov. 22·73849	+ 18·277 P.A.	222 20 29	+ 0·154 p	+ 0·088 π	− 0·700 α	+ 0·674 δ	= + 5	= + 0·04
612	22·74405	,,	222 19 2	·154	·096	·701	·673	+ 60	+ 0·45
616	22·75889	,,	222 15 5	·155	·118	·701	·673	+ 61	+ 0·46
618	22·76435	,,	222 13 37	·156	·124	·702	·672	+ 42	+ 0·32
			″		″				
613	Nov. 22·7	Stands. D.	6522·16	+ 0·652 s	= − 0·04				
614	22·7	,, P.A.	45° 56′ 18″	·652 p	−36	= − 1·14			
			″					″	
619	Nov. 23·47845	+ 19·324 D.	5952·59	+ 0·595 s	+ 0·632 π	+ 0·396 α	− 0·909 δ	= − 0·79	
622	23·49269	,,	5957·11	·596	·602	·395	·909	− 0·62	
620	Nov. 23·48472	+ 16·247 D.	6682·01	+ 0·668 s	− 0·459 π	− 0·029 α	+ 0·999 δ	= + 0·26	
621	23·48799	,,	6680·48	·668	·457	·029	·999	− 0·18	

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	″					″	
625	Nov. 30·45822	+ 17·315 D.	701·80	+ 0·070 s	− 0·276 π	+ 0·268 α	+ 0·960 δ	= + 0·76	
627	30·46843	,,	697·71	·070	·275	·269	·959	+ 0·36	
629	30·47811	,,	693·83	·069	·276	·270	·959	+ 0·68	
631	30·50100	,,	684·61	·068	·279	·271	·958	+ 0·34	
			° ′ ″					″	″
626	Nov. 30·45833	+ 17·315 P.A.	16 20 20	+ 0·070 p	+ 0·620 π	+ 0·915 α	− 0·281 δ	= −131	= − 0·44
628	34·46861	,,	16 23 4	·070	·588	·914	·282	− 88	− 0·30
630	34·47878	,,	16 25 44	·069	·554	·914	·283	−198	− 0·66
632	30·50308	,,	16 31 56	·068	·471	·914	·284	− 85	− 0·28
			″		″				
623	Nov. 30·4	Stands. D.	6522·24	+ 0·652 s	= − 0·26				
633	30·5	,, D.	,,	·652	+ 0·42	″			
624	30·4	,, P.A.	45°56′18″	·652 p	+ 6	= + 0·19			
634	30·5	,, P.A.	,,	·652	−12	− 0·38			
			″					″	
637	Dec. 1·43850	+ 17·315 D.	333·23	+ 0·033 s	− 0·072 π	+ 0·524 α	+ 0·836 δ	= + 0·79	
639	1·44631	,,	330·57	·033	·073	·526	·833	+ 0·38	
641	1·45507	,,	327·62	·033	·076	·531	·831	+ 0·18	
643	1·46095	,,	325·64	·033	·078	·533	·828	+ 0·43	
			° ′ ″					″	″
638	Dec 1·43826	+ 17·315 P.A.	33 21 15	+ 0·033 p	+ 0·729 π	+ 0·796 α	− 0·550 δ	= −454	= − 0·72
640	1·44763	,,	33 38 39	·033	·712	·795	·553	−367	− 0·59
642	1·45499	,,	33 54 53	·033	·679	·793	·557	−811	− 1·30
644	1·46143	,,	34 7 57	·033	·664	·789	·560	−280	− 0·45
			″		″				
635	Dec. 1·4	Stands. D.	6522·25	+ 0·652 s	= − 0·03				
645	1·5	,, D.	,,	·652	− 0·12	″			
636	1·4	,, P.A.	45°56′18″	·652 p	+ 1	= + 0·03			
646	1·5	,, P.A.	,,	·652	+ 8	+ 0·25			
			″					″	
647	Dec. 1·74474	+ 17·315 D.	234·26	+ 0·023 s	− 0·739 π	+ 0·706 α	+ 0·672 δ	= + 0·24	
649	1·75196	,,	232·24	·023	·752	·710	·666	− 0·35	
653	1·77259	,,	224·01	·022	·807	·727	·647	− 0·24	
655	1·78264	,,	221·45	·022	·828	·735	·637	− 0·40	
			° ′ ″					″	″
648	Dec. 1·74526	+ 17·315 P.A.	47 50 29	+ 0·023 p	− 0·045 π	+ 0·640 α	− 0·741 δ	= −683	= − 0·76
650	1·75274	,,	48 22 43	·023	·044	·635	·746	−351	− 0·39
654	1·77245	,,	50 38 13	·022	·030	·616	·763	−606	− 0·65
656	1·78286	,,	51 28 36	·022	·020	·607	·772	−469	− 0·50
			″		″				
651	Dec. 1·8	Stands. D.	6522·25	+ 0·652 s	= + 0·16				
652	1·8	,, P.A.	45°56′18″	·652 p	−33	= − 1·05			

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.				
		°	″					″
659	Dec. 2·43787	+ 17·315 D.	229·11	+ 0·023 s	+ 0·710 π	+ 0·834 α	− 0·486 δ	= − 0·95
661	2·44554	„	230·57	·023	·688	·829	·496	− 1·07
663	2·45343	„	232·07	·023	·669	·822	·506	− 0·42
665	2·45956	„	233·26	·023	·646	·817	·514	− 0·95
			° ′ ″					″ ″
660	Dec. 2·43777	+ 17·315 P.A.	119 9 32	+ 0·023 p	+ 0·126 π	− 0·463 α	− 0·874 δ	= −480 = − 0·53
662	2·44529	„	119 45 43	·023	·120	·473	·868	−497 − 0·55
664	2·45350	„	120 24 49	·023	·117	·483	·862	−268 − 0·30
666	2·45971	„	120 54 12	·023	·116	·490	·856	−290 − 0·32
			″		″			
657	Dec. 2·4	Stands. D.	6522·26	+ 0·652 s	= + 0·31			
667	2·5	„ D.	„	·652	− 0·07	″		
658	2·4	„ P.A.	45° 56′ 18″	·652 p	+18	= + 0·57		
668	2·5	„ P.A.	„	·652	−24	− 0·76		
			″					″
669	Dec. 2·73015	+ 17·315 D.	299·73	+ 0·030 s	− 0·029 π	+ 0·637 α	− 0·744 δ	= − 0·97
671	2·73929	„	302·49	·030	·032	·631	·749	− 1·01
675	2·76429	„	310·23	·031	·031	·616	·762	− 0·11
677	2·77239	„	312·79	·031	·030	·612	·765	− 0·96
			° ′ ″					″ ″
670	Dec. 2·72946	+ 17·315 P.A.	138 5 13	+ 0·030 p	+ 0·703 π	− 0·710 α	− 0·668 δ	= − 47 = − 0·07
672	2·73936	„	138 33 4	·030	·730	·715	·662	− 10 − 0·01
676	2·76441	„	139 40 22	·031	·790	·727	·646	+ 6 + 0·01
678	2·77197	„	139 59 50	·031	·801	·730	·642	−399 − 0·60
			″		″			
673	Dec. 2·8	Stands. D.	6522·26	+ 0·652 s	= + 0·12	″		
674	2·8	„ P.A.	45° 56′ 18″	·652 p	−15	= − 0·48		
			″					″
681	Dec. 4·42089	+ 17·315 D.	907·92	+ 0·091 s	+ 0·642 π	+ 0·347 α	− 0·932 δ	= − 0·85
683	4·42890	„	910·71	·091	·622	·346	·932	− 0·17
685	4·43936	„	914·36	·091	·603	·345	·933	− 0·29
687	4·44716	„	917·08	·092	·597	·345	·933	− 0·75
			° ′ ″					″ ″
682	Dec. 4·42114	+ 17·315 P.A.	158 43 5	+ 0·091 p	− 0·372 π	− 0·890 α	− 0·363 δ	= + 10 = + 0·04
684	4·42919	„	158 44 49	·091	·354	·890	·362	+ 78 + 0·34
686	4·43960	„	158 47 7	·091	·335	·891	·361	+ 85 + 0·37
688	4·44746	„	158 48 53	·092	·319	·891	·361	+112 + 0·50
			″		″			
679	Dec. 4·4	Stands. D.	6522·28	+ 0·652 s	= + 0·20	″		
680	4·4	„	45° 56′ 17″	·652 p	− 8	= − 0·25		
			″					″
689	Dec. 6·41155	+ 16·247 D.	1562·18	+ 0·156 s	− 0·696 π	− 0·491 α	+ 0·858 δ	= + 0·24
691	6·41840	„	1559·82	·156	·683	·491	·858	+ 0·13
695	6·43238	„	1555·01	·155	·647	·491	·858	− 0·09
697	6·43853	„	1552·90	·155	·633	·491	·858	+ 0·23

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No.	Date. 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	° ′ ″					″	″
690	Dec. 6·41184	+ 16·247 P.A.	329 6 42	+ 0·156 p	+ 0·261 π	+ 0·820 α	+ 0·514 δ	= + 11	= + 0·08
692	6·41854	,,	329 6 3	·156	·249	·820	·514	— 22	— 0·17
696	6·43211	,,	329 4 40	·155	·227	·820	·514	— 56	— 0·42
698	6·43862	,,	329 3 59	·155	·215	·820	·514	— 30	— 0·23
			″		″				
693	Dec. 6·4	Stands. D.	6522·30	+ 0·652 s	= — 0·10				
694	6·4	,, P.A.	45° 56′ 17″	·652 p	—32	= — 1·02			
			″					″	
699	Dec. 6·71223	+ 16·247 D.	1458·04	+ 0·146 s	— 0·101 π	— 0·500 α	+ 0·852 δ	= — 0·15	
701	6·71699	,,	1456·32	·146	·100	·500	·852	— 0·32	
705	6·73028	,,	1451·52	·145	·092	·501	·852	— 0·04	
707	6·73513	,,	1449·76	·145	·090	·501	·851	+ 0·11	
			° ′ ″					″	″
700	Dec. 6·71217	+ 16·247 P.A.	328 27 19	+ 0·146 p	— 0·663 π	+ 0·815 α	+ 0·523 δ	= — 16	= — 0·11
702	6·71713	,,	328 26 42	·146	·672	·815	·523	— 23	— 0·16
706	6·73040	,,	328 25 7	·145	·709	·814	·524	— 36	— 0·25
708	6·73534	,,	328 24 34	·145	·722	·814	·524	+ 15	+ 0·11
			″		″				
703	Dec. 6·7	Stands. D.	6522·30	+ 0·652 s	= + 0·44				
704	6·7	,, P.A.	45° 56′ 17″	·652 p	0	= 0·00			
			″					″	
711	Dec. 12·45314	+ 16·247 D.	850·09	+ 0·085 s	+ 0·538 π	+ 0·854 α	— 0·453 δ	= + 0·39	
713	12·46102	,,	853·19	·085	·517	·854	·454	— 0·12	
715	12·47031	,,	856·84	·086	·485	·854	·455	— 0·08	
717	12·47677	,,	859·39	·086	·461	·853	·455	+ 0·39	
			° ′ ″					″	″
712	Dec. 12·45330	+ 16·247 P.A.	116 58 31	+ 0·085 p	+ 0·170 π	— 0·434 α	— 0·891 δ	= —189	= — 0·78
714	12·46138	,,	117 0 35	·085	·174	·435	·891	— 80	— 0·33
716	12·47041	,,	117 2 57	·086	·184	·436	·891	—127	— 0·53
718	12·47704	,,	117 4 45	·086	·192	·436	·890	— 41	— 0·17
			″		″				
709	Dec. 12·4	Stands. D.	6522·36	+ 0·652 s	= + 0·16				
710	12·4	,, P.A.	45° 56′ 17″	·652 p	—15	= — 0·48			
			″					″	
719	Dec. 12·70692	+ 16·247 D.	950·80	+ 0·095 s	— 0·245 π	+ 0·846 α	— 0·470 δ	= — 0·15	
721	12·72043	,,	956·41	·096	·271	·845	·470	+ 0·28	
			° ′ ″					″	″
720	Dec. 12·70732	+ 16·247 P.A.	118 2 24	+ 0·095 p	+ 0·615 π	— 0·450 α	— 0·883 δ	= — 25	= — 0·12
722	12·72043	,,	118 5 12	·096	·641	·450	·882	— 93	— 0·43
			″		″				
723	Dec. 12·7	Stands. D.	6522·36	+ 0·652 s	= — 0·30				
724	12·7	,, P.A.	45° 56′ 17″	652 p	—13	= — 0·41			

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No.	Date, 1888. G.M.T.	Objects.	Computed Values.	Equations of Condition.					
		°	″					″	
727	Dec. 13·41767	+ 16·247 D.	1271·39	+ 0·127 s	+ 0·637 π	+ 0·840 α	− 0·481 δ	= + 0·64	
729	13·42525	,,	1274·56	·128	·614	·840	·481	+ 0·63	
731	13·43226	,,	1277·49	·128	·595	·839	·482	+ 0·20	
733	13·43924	,,	1280·40	·128	·571	·839	·482	+ 0·40	
			° ′ ″					″	″
728	Dec. 13·41778	+ 16·247 P.A.	118 48 59	+ 0·127 p	+ 0·130 π	− 0·461 α	− 0·877 δ	= −106	= − 0·65
730	13·42538	,,	118 49 23	·128	·134	·461	·876	− 93	− 0·58
732	13·43237	,,	118 49 46	·128	·138	·462	·876	−103	− 0·64
734	13·43914	,,	118 50 8	·128	·143	·462	·876	− 70	− 0·43
			″		″				
725	Dec. 13·4	Stands. D.	6522·37	+ 0·652 s	= + 0·33	″			
726	13·4	,, P.A.	45° 56′ 17″	·652 p	−14	= − 0·44			
			″					″	
735	Dec. 13·69878	+ 16·247 D.	1388·89	+ 0·139 s	− 0·229 π	+ 0·837 α	− 0·487 δ	= − 0·03	
737	13·71685	,,	1396·76	·140	·251	·837	·487	+ 0·07	
739	13·72830	,,	1401·79	·140	·273	·837	·488	− 0·09	
741	13·74387	,,	1408·68	·141	·285	·836	·488	− 0·16	
			° ′ ″					″	″
736	Dec. 13·69901	+ 16·247 P.A.	119 8 44	+ 0·139 p	+ 0·609 π	− 0·467 α	− 0·874 δ	= − 56	= − 0·38
738	13·71677	,,	119 9 48	·140	·642	·467	·874	−134	− 0·91
740	13·72461	,,	119 10 14	·140	·657	·468	·874	− 20	− 0·13
742	13·74558	,,	119 11 20	·141	·693	·468	·873	+ 36	+ 0·25

9.—Determination of Relative Weights.

Before proceeding to a solution of the equations of condition, their relative accuracy must be ascertained or estimated. I have assumed that the probable error (ε) of the mean result of a number (n) of observations of distance or position-angle on a night can be found from the expression :

$$\varepsilon^2 = \varepsilon_1^2/n + \varepsilon_2^2 + \varepsilon_3^2.$$

ε_1 is the casual probable error of one observation of four pointings ; ε_2 the systematic instrumental probable error due chiefly to division-error of the scales in the case of the distance measures, and to the numerous sources of error for the position-angles ; ε_3 is the probable error due to the irregularities of the ephemeris. It is clearly unnecessary, in the mode of treatment adopted, to consider the uncertainty of the star-places.

For the probable error of observation, ε_1, I have derived values for the distance and angle measures from a single star by neglecting any possible variation of scale-value and instrumental adjustment during one sitting, and comparing the values

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Obs.—Comp. on the right-hand side of the equations of condition with their mean values for the night. This leads to the following table :—

PROBABLE ERROR OF OBSERVATION FOR "SINGLE STARS."

Observatory.	Observer.	Measure.	Observations.	Nights.	ϵ_1
					"
Cape	Gill	Distances	42	8	± 0·086
	Finlay	"	32	8	0·107
	G. and F.	"	74	16	0·095
	Gill	Angles	26	7	0·134
	Finlay	"	24	5	0·117
	G. and F.	"	50	12	0·126
	Gill	Distances and Angles	68	15	0·106
	Finlay	" "	56	13	0·112
	G. and F.	" "	124	28	0·109
Leipzig	Peter	Distances	18	9	0·095
	"	Angles	18	9	0·084
	"	Distances and Angles	36	18	0·090
Yale	Elkin	Distances	62	13	0·167
	Hall	"	28	7	0·205
	E. and H.	"	90	20	0·180
	Elkin	Angles	62	13	0·226
	Hall	"	28	7	0·164
	E. and H.	"	90	20	0·211
	Elkin	Distances and Angles	124	26	0·199
	Hall	" "	56	14	0·185
	E. and H.	" "	180	40	0·194

In deriving the values for the Cape series, it must be stated that in accordance with Dr. Gill's researches the observations have been weighted with reference to the atmospheric conditions of definition. For the worst state, noted as 4, a weight of $\frac{1}{3}$, for the qualities 3—4 and 3 weights of $\frac{1}{2}$ and $\frac{2}{3}$ respectively have been taken, while for the remainder a weight unity has been assumed throughout; the Iris series itself is not of sufficient extent to admit of any more rigid determination. For the Leipzig and Yale measures all have been given equal weight, as the definition varied but little from an average state throughout.

For the series of measures from two opposite stars, where, in general, the distances are quite large, I have thought it desirable to eliminate the variations of scale-value, and have done this by deriving the probable error of observation from the *difference* of the two distances corrected for change of scale-value by means of their *sum*, using, of course, the values Obs.—Comp. of the equations of condition. The probable error of a *difference*

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derived from a "set" of four observations is the same as that of one observation, and is found to be as follows, using the weights, as before described, for the Cape series:—

PROBABLE ERROR OF OBSERVATION FOR "OPPOSITE STARS."

Observatory.	Observer.	Sets.	Nights.	ϵ_1
				″
Cape.	Gill.	15	7	± 0·125
	Finlay.	8	4	0·115
	G. and F.	23	11	0·121
Leipzig.	Peter.	18	9	0·096
Yale.	Elkin.	68	22	0·225
	Hall.	40	20	0·166
	E. and H.	108	42	0·209

From these tables I have inferred as a sufficient approximation—

Cape ...	...	"Single star" measures	$\epsilon_1 = \pm$ 0″·11
" ...	...	"Opposite star" measures	0·12
Leipzig	...	All measures	0·10
Yale ...	...	All measures	0·20

For ϵ_2, the instrumental systematic error, I have taken the values—

Cape ...	...	Distances	$\epsilon_2 = \pm$ 0″·02
" ...	...	Angles	0·06
Leipzig	...	Distances and angles	0·06
Yale ..	...	Distances and angles	0·06

which are based on the same considerations as those stated by Dr. Gill, with the exception that I consider the systematic error of the position-circle readings equivalent to that of the uncorrected scale readings.

For ϵ_3, the probable uncertainty of the ephemeris, I take ± 0″·04.

With these values the following table of weights was derived, taking ± 0″·10 as corresponding to weight unity.

No. of Measures.	Cape.			Leipzig. All Measures.	Yale. All Measures.
	Single Distances.	Single Angles.	Double Distances.		
1	0·71	0·58	0·61	...	...
2	1·24	0·89	1·09	0·98	0·40
3	1·66	1·08	1·46	1·18	0·54
4	1·99	1·22	1·79	1·30	0·66
6	2·50	1·39	2·27	...	0·84
8	2·86	1·49	2·64	...	0·98

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I have modified these values somewhat in practice, by increasing the weights for the large numbers of observations for the Cape series, in accordance with a remark of Dr. Gill's that the most accurate measures were likely to be on the nights when a large number were secured, and also increasing the weights for the Yale series slightly, as the large casual error ϵ_1 could be materially reduced by rejecting the results of one discordant night (November 22, position-angles in the evening). The Oxford measures have been considered equivalent to the Yale ones, and by rounding off I have arrived at the following table of

ADOPTED WEIGHTS.

No. of Measures.	Cape.		Leipzig. All Measures.	Yale and Oxford. All Measures.
	Distances.	Angles.		
1	0·7	0·5	...	...
2	1·4	0·8	0·9	0·6
3	1·9	1·0	1·1	0·8
4	2·4	1·2	1·2	0·9
6	3·0	1·4	...	1·1
8	3·5	1·5	...	1·2

10.—Solution of Equations of Condition in Groups.

The treatment of the equations of condition which I designate "in Groups," consists, as already intimated, in grouping together all the results depending on any one star or pair of stars. The place of the planet, as given by the ephemeris, is considered as relative to these reference points, and subject to errors which may be expressed in powers of the time from a chosen epoch.

The results of each night have been combined by taking the mean of all the equations of condition obtained from observations at any one sitting, and giving this mean the weight just derived for the number of measures secured. The variations in the parallax factors are not large enough to cause any sensible loss of weight by thus not taking each separate equation of condition.

To the means thus deduced the terms expressing the variations of the ephemeris error are to be added, formed from the difference $(t-t_0)$ of the mean date t and the chosen epoch t_0. When the group consists of simultaneous measures on one night only, these terms naturally do not appear; when the group extends over two days only it is clear that only the first power of $(t-t_0)$ can be taken. For all groups of

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greater extent the term $(t-t_0)^2$ has been included. When the planet was referred to a single star by distances and position-angles, both Right Ascension and Declination is determined, and these terms depending on the time are introduced for both co-ordinates. When only distance measures from two opposite stars were taken, it is evident that the heliometer results can furnish the ephemeris error in but one direction, and I have thought it permissible and advisable to project the measures on the line joining the two stars, and to consider the ephemeris error and its variations in this direction only. I may say that it is regretable that we did not foresee that the programme of observation should include for these double distances a limited number of position-angle measures which would have furnished the means for an absolutely rigid solution. As stated, however, our original plan contemplated only a combination of the simultaneous measures at the Cape and at Yale, for which other data would be superfluous.

Since the planning and execution of these series on the minor planets the existence of large personal errors in the heliometer-distance measures has come to light. These errors are due, doubtless, in large part, to the curvature of the path described by the star-images when made to cross each other in estimating their coincidence. The length of this path and the consequent curvature are probably dependent on a large variety of circumstances, such as the magnitude of the stars, the definition, the power used, the physical condition of the observer and others, and the effect of this disturbing factor is, doubtless, different according as there is a fixed direction visible in the field of view, such as that of the wires marking the centre of the field or not. The law of these errors is, therefore, a very complex one, but, as is shown by Dr. Gill, and as appeared in the Yale Polar Triangulation, a principal term must be one depending on the reciprocal of the distance, down to a certain limit of distance, at all events. The Iris series is not adapted to furnish any contribution towards the knowledge of the law, as the necessary sub-divisions and elimination of the star places preclude the introduction of any further unknowns, but I have considered it advisable to show the effect of this principal term, and have added on the right-hand side of the equations of condition a term proportional to 1/S, and designated it by E, F, G, H, P and S, the initials of the several observers, as done by Dr. Gill in the discussion of the Victoria series.

Group A.—Epoch, October 12·0.

This first group consists of measures of distance and angle from the star + 24°·376. This star is double, the fainter component being in the distance 38″·43 and in the position-angle 274° 46′ according to a series of measures with the Yale heliometer. The Yale comparisons were made with the brighter component, and, hence, the Cape results from the fainter one on October 12 and 13 have not been taken

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into consideration. If we form the mean values of the equations of condition for each day and apply to the results the correction for scale-value and index-error as derived from the observations of the "standards," and further introduce terms a' and δ' of which the co-efficients are equal respectively to those of a and δ multiplied by $(t - t_0)$, we get the following data :—

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.
1	Oct. 10·57	$+ 0{\cdot}767\,\pi + 0{\cdot}881\,a - 1{\cdot}259\,a' - 0{\cdot}258\,\delta + 0{\cdot}369\,\delta' = - 0''{\cdot}189 + 0{\cdot}855$ E.	4	0·9
2	Yale.	$+ 0{\cdot}280 \quad - 0{\cdot}235 \quad + 0{\cdot}336 \quad - 0{\cdot}966 \quad + 1{\cdot}381 \quad + 0{\cdot}616$	4	0·9
3	Oct. 10·92	$- 0{\cdot}450\,\pi + 0{\cdot}851\,a - 0{\cdot}911\,a' - 0{\cdot}361\,\delta + 0{\cdot}387\,\delta' \quad - 0{\cdot}103 + 0{\cdot}970$ E.	4	0·9
4	Yale.	$+ 0{\cdot}662 \quad - 0{\cdot}330 \quad + 0{\cdot}353 \quad - 0{\cdot}932 \quad + 0{\cdot}998 \quad + 0{\cdot}520$	4	0·9
5	Oct. 11·58	$+ 0{\cdot}758\,\pi + 0{\cdot}732\,a - 0{\cdot}304\,a' - 0{\cdot}598\,\delta + 0{\cdot}247\,\delta' \quad - 0{\cdot}350 + 1{\cdot}162$ E.	4	0·9
6	Yale.	$- 0{\cdot}015 \quad - 0{\cdot}546 \quad + 0{\cdot}228 \quad - 0{\cdot}801 \quad + 0{\cdot}333 \quad + 0{\cdot}124$	4	0·9
7	Oct. 12·57 Cape.	$- 0{\cdot}878\,\pi + 0{\cdot}274\,a + 0{\cdot}157\,a' - 0{\cdot}953\,\delta - 0{\cdot}548\,\delta' \quad + 0{\cdot}534 + 1{\cdot}317$ G.	1	0·7

The terms E and G represent, as explained, the effect of a systematic error of the form 1/S for the observers Elkin and Gill respectively. Giving the several equations the adjoined weights we find the following normal equations :—

Normals for π, a, a', δ and δ'.

$$
\begin{array}{lllllllll}
+ 2{\cdot}233\,\pi & + 0{\cdot}345\,a & - 0{\cdot}512\,a' & - 0{\cdot}645\,\delta & + 1{\cdot}540\,\delta' & = & - 0{\cdot}193 & + 0{\cdot}990\text{ E.} & - 0{\cdot}808\text{ G.} \\
+ 0{\cdot}345 & + 2{\cdot}299 & - 2{\cdot}152 & - 0{\cdot}183 & - 0{\cdot}105 & & - 0{\cdot}702 & + 2{\cdot}186 & + 0{\cdot}252 \\
- 0{\cdot}512 & - 2{\cdot}152 & + 2{\cdot}533 & - 0{\cdot}105 & - 0{\cdot}061 & & + 0{\cdot}829 & - 2{\cdot}172 & + 0{\cdot}144 \\
- 0{\cdot}645 & - 0{\cdot}183 & - 0{\cdot}105 & + 3{\cdot}335 & - 2{\cdot}259 & & - 1{\cdot}152 & - 1{\cdot}149 & - 0{\cdot}878 \\
+ 1{\cdot}540 & - 0{\cdot}105 & - 0{\cdot}061 & - 2{\cdot}259 & + 3{\cdot}237 & & + 0{\cdot}892 & + 0{\cdot}880 & - 0{\cdot}505
\end{array}
$$

Eliminating the unknowns a, a', δ and δ' in the usual symmetrical process we arrive at the equation for π, which gives its combining weight—

$$+ 1{\cdot}303\,\pi \quad = - 0''{\cdot}335 \quad + 0{\cdot}268\text{ E.} \quad - 0{\cdot}277\text{ G.}$$

Group B.—Epoch, October 14·5.

This group contains observations of the stars + 24°·369 and + 22°·375 made at the Cape on October 14 ; as no corresponding measures of this pair were secured in the Northern Hemisphere no parallax result can be derived.

Group C.—Epoch, October 17·0.

This group is a series of comparisons with the two stars, + 22°·372 and + 24°·358. The mean values of the co-efficients of the scale-value and the parallax correction and the absolute term have been formed from the data in the preceding

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section. These values have been multiplied by the factor $\cos(p-p_0)$ where p_0 is the position-angle, given in section 6, of the line joining the comparison stars, and p that of Iris and the star used. Introducing then as unknowns, the ephemeris correction in the direction p_0, its variations, proportional to the time and the square of the time from the chosen epoch, which we denote by κ, κ' and κ'' respectively, we find the following equations of condition, together with the effect of a systematic error of the form 1/S.

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Oct. 15·56	+0·413 s_1	+0·824 π	+1·000 κ	−1·440 κ'	+2·074 κ''	= −0·411	+0·242 F.	2	0·5	0·945
2	Cape.	+0·520	−0·843	−1·000	+1·440	−2·074	+0·270	+0·192	2	0·5	0·965
3	Oct. 15·72	+0·413 s_2	−0·303 π	+1·000 κ	−1·280 κ'	+1·638 κ''	−0·630	+0·242 E.	4	0·9	0·952
4	Yale.	+0·521	+0·272	−1·000	+1·280	−1·638	+0·685	+0·192	4	0·9	0·969
5	Oct. 16·60	+0·418 s_3	−0·567 π	+1·000 κ	−0·400 κ'	+0·160 κ''	−0·423	+0·239 E.	6	1·1	0·983
6	Yale.	+0·517	+0·641	−1·000	+0·400	−0·160	+0·255	+0·194	6	1·1	0·989
7	Oct. 17·56	+0·422 s_4	−0·713 π	+1·000 κ	+0·560 κ'	+0·314 κ''	−0·452	+0·237 E.	8	1·2	0·999
8	Yale.	+0·513	+0·738	−1·000	−0·560	−0·314	+0·279	+0·195	8	1·2	0·999
9	Oct. 18·31	+0·425 s_5	−0·828 π	+1·000 κ	+1·310 κ'	+1·716 κ''	−0·331	+0·236 P.	4	1·2	0·998
10	Leipzig.	+0·511	+0·811	−1·000	−1·310	−1·716	+0·454	+0·196	4	1·2	0·998
11	Oct. 18·57	+0·426 s_6	−0·730 π	+1·000 κ	+1·570 κ'	+2·465 κ''	−0·483	+0·235 E.	8	1·2	0·993
12	Yale.	+0·509	+0·678	−1·000	−1·570	−2·465	+0·136	+0·197	8	1·2	0·995

The normal equations which determine the quantities s_1 .....s_6, π, κ, κ' and κ'' have been formed, using the annexed weights, in the usual manner. But for the sake of conciseness and convenience I will give those for π, κ, κ' and κ'' after the unknowns s_1 .....s_6 have been eliminated in the usual symmetrical process. We have thus :—

Normals for Scale-Values.

+ 0·220 s_1	− 0·054 π	− 0·059 κ	+ 0·084 κ'	− 0·111 κ''	= − 0·013	+ 0·100 F.
+ 0·398 s_2	+ 0·015	− 0·098	+ 0·124	− 0·159	+ 0·091	+ 0·180 E.
+ 0·486 s_3	+ 0·103	− 0·109	+ 0·044	− 0·018	− 0·049	+ 0·220 E.
+ 0·529 s_4	+ 0·094	− 0·109	− 0·061	− 0·034	− 0·058	+ 0·240 E.
+ 0·530 s_5	+ 0·074	− 0·103	− 0·136	− 0·177	+ 0·109	+ 0·240 P.
+ 0·528 s_6	+ 0·041	− 0·100	− 0·156	− 0·246	− 0·164	+ 0·240 E.

Normals for π, κ, κ' and κ''.

+ 5·655 π	− 6·352 κ	− 6·170 κ'	− 7·388 κ''	= + 2·448	− 0·236 E.	+ 0·040 F.	− 0·062 P.
− 6·352	+12·079	+ 3·621	+15·998	− 4·846	+ 0·380	+ 0·049	+ 0·094
− 6·170	+ 3·621	+16·006	+ 8·179	− 0·633	+ 0·037	− 0·071	+ 0·136
− 7·388	+15·998	+ 8·179	+30·332	− 6·502	+ 0·420	+ 0·101	+ 0·163

Eliminating from these the quantities κ, κ' and κ'', we find an equation for π which has the proper weight for combination with those from the other groups, viz. :—

$$+ 0{\cdot}621\ \pi = + 0{\cdot}193 \quad - 0{\cdot}068\ \text{E.} \quad + 0{\cdot}027\ \text{F.} \quad + 0{\cdot}022\ \text{P.}$$

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Group D.—Epoch, October 21·5.

This group consists of distance measures from the two opposite stars $+22^{\circ}\cdot368$ and $+23^{\circ}\cdot326$. As the observations are simultaneous the variation of κ need not be considered.

No.	Date. Observatory.	Reduced Equations of Condition.	Meas.	Wt.	Factor.
1	Oct. 21·54	$+0\cdot381\,s_1 + 0\cdot819\,\pi + 1\cdot000\,\kappa = -0''\cdot420 + 0\cdot087\,F. + 0\cdot174\,G.$	6	2·8	0·993
2	Cape.	$+0\cdot414 - 0\cdot876 - 1\cdot000 + 0\cdot204 + 0\cdot080 + 0\cdot161$	6	2·8	0·994
3	Oct. 21·55	$+0\cdot380\,s_2 - 0\cdot801\,\pi + 1\cdot000\,\kappa - 0\cdot610 + 0\cdot263\,E.$	8	1·2	0·993
4	Yale.	$+0\cdot416 + 0\cdot763 - 1\cdot000 + 0\cdot111 + 0\cdot240$	8	1·2	0·994

Normals for Scale-Values.

$$+0\cdot885\,s_1 - 0\cdot143\,\pi - 0\cdot092\,\kappa = -0\cdot213 + 0\cdot187\,F. + 0\cdot373\,G.$$
$$+0\cdot380\,s_2 + 0\cdot016 - 0\cdot043 - 0\cdot223 + 0\cdot240\,E.$$

Normals for π and κ.

$$+5\cdot472\,\pi + 2\cdot856\,\kappa = -0''\cdot800 - 0\cdot042\,E. + 0\cdot033\,F. + 0\cdot065\,G.$$
$$+2\cdot856 + 7\cdot985 - 2\cdot660 + 0\cdot055 + 0\cdot039 + 0\cdot079$$

Whence

$$4\cdot451\,\pi = +0''\cdot150 - 0\cdot062\,E. + 0\cdot019\,F. + 0\cdot037\,G.$$

Group E.—Epoch, October 25·0.

Measures of distances and position-angles from $+22^{\circ}\cdot354$. Applying the corrections from the standards and adding the systematic error terms we have :—

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.
1	Oct. 22·54 Cape.	$-0\cdot907\,\pi + 0\cdot350\,\alpha - 0\cdot862\,\alpha' - 0\cdot924\,\delta + 2\cdot278\,\delta' = +0''\cdot235$	4	1·2
2	Oct. 24·28	$+0\cdot447\,\pi - 0\cdot272\,\alpha + 0\cdot195\,\alpha' - 0\cdot955\,\delta + 0\cdot688\,\delta' + 0\cdot043 + 3\cdot032\,P.$	2	0·9
3	Leipzig.	$-0\cdot754 - 0\cdot880 + 0\cdot634 + 0\cdot290 - 0\cdot208 + 0\cdot390$	2	0·9
4	Oct. 24·54	$-0\cdot446\,\pi - 0\cdot511\,\alpha + 0\cdot240\,\alpha' - 0\cdot832\,\delta + 0\cdot391\,\delta' + 0\cdot267 + 2\cdot041\,G.$	2	0·4
5	Cape.	$+0\cdot838 - 0\cdot761 + 0\cdot345 + 0\cdot561 - 0\cdot254 + 0\cdot273$	4	0·6
6	Oct. 24·56	$+0\cdot038\,\pi - 0\cdot497\,\alpha + 0\cdot221\,\alpha' - 0\cdot843\,\delta + 0\cdot375\,\delta' - 0\cdot058 + 1\cdot962\,E.$	6	1·1
7	Yale.	$-0\cdot778 - 0\cdot775 + 0\cdot345 + 0\cdot539 - 0\cdot239 + 0\cdot015$	6	1·1
8	Oct. 24·89	$+0\cdot844\,\pi - 0\cdot610\,\alpha + 0\cdot068\,\alpha' - 0\cdot749\,\delta + 0\cdot081\,\delta' + 0\cdot137 + 1\cdot299\,E.$	8	1·2
9	Yale.	$+0\cdot194 - 0\cdot689 + 0\cdot075 + 0\cdot663 - 0\cdot072 - 0\cdot147$	8	1·2

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Normals for π, a, a', δ *and* δ'.

+ 3·755 π	− 0·317 a	+ 0·515 a'	− 0·238 δ	− 1·977 δ'	= − 0″·325	+ 1·394 E.	− 0·365 G.	+ 1·219 P.
− 0·317	+ 3·310	− 1·646	− 0·468	+ 0·988	− 0·362	− 2·024	− 0·418	− 0·742
+ 0·515	− 1·646	+ 1·581	+ 0·989	− 2·368	+ 0·055	+ 0·583	+ 0·196	+ 0·532
− 0·238	− 0·468	+ 0·989	+ 4·690	− 4·005	− 0·369	− 2·990	− 0·682	− 2·603
− 1·977	+ 0·988	− 2·368	− 4·005	+ 7·021	+ 0·592	+ 0·936	+ 0·320	+ 1·876

whence we find the final equation for π:

$$+ 1{\cdot}791\,\pi = -0''{\cdot}050 + 1{\cdot}100\,\text{E.} - 0{\cdot}291\,\text{G.} - 0{\cdot}492\,\text{P.}$$

Group F.—Epoch, October 25·0.

This group consists of double distances and position-angles from the two stars + 22°·354 and + 22°·347, the position of which is such that for the regular series the parallax effect is nearly entirely on the angles. By a regretable misunderstanding only the distances were observed at the Cape, so that the weight of the group is but small, and depends mainly on the Yale morning observations. The double position-angles have been considered as of the same accuracy as double distances.

No.	Date, Observatory.	Reduced Equations of Condition.								Meas.	Wt.
1	Oct. 25·28	+0·106 s_1	+0·028 π	−0·656 a	−0·184 a'	−0·703 δ	−0·197 δ'	= +0″·415	+0·943 P.	2	0·9
2	Leipzig.	+0·106 p_1	−0·878	−0·648	−0·181	+0·711	+0·199	+0·195		2	0·9
3		+0·176 s_1	−0·152	+0·565	+0·158	+0·790	+0·221	−0·200	+0·568 P.	2	0·9
4		+0·176 p_1	+0·872	+0·728	+0·204	−0·613	−0·171	+0·010		2	0·9
5	Oct. 25·52	+0·124 s_2	−0·314 π	−0·682 a	−0·353 a'	−0·672 δ	−0·346 δ'	+0·170	+0·807 F.	4	1·6
6	Cape.	+0·159 s_2	+0·488	+0·532	+0·274	+0·818	+0·423	−0·325	+0·628	4	1·6
7	Oct. 25·54	+0·126 s_3	−0·147 π	−0·676 a	−0·365 a'	−0·679 δ	−0·366 δ'	+0·550	+0·794 E.	4	0·9
8	Yale.	+0·128 p_3	−0·797	−0·627	−0·338	+0·733	+0·396	−0·245		4	0·9
9		+0·157 s_3	+0·067	+0·626	+0·338	+0·815	+0·440	−0·415	+0·638 E.	4	0·9
10		+0·155 p_3	+0·835	+0·752	+0·408	−0·578	−0·314	−0·167		4	0·9
11	Oct. 25·87	+0·153 s_4	+0·809 π	−0·697 a	−0·607 a'	−0·655 δ	−0·568 δ'	+0·443	+0·654 E.	3	0·8
12	Yale.	+0·153 p_4	+0·078	−0·604	−0·524	+0·756	+0·655	−0·380		3	0·8
13		+0·132 s_4	−0·750	+0·472	+0·411	+0·858	+0·747	−0·160	+0·758 E.	3	0·8
14		+0·132 p_4	−0·330	+0·791	+0·688	−0·512	−0·445	−0·523		3	0·8

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Normals for Scale-Values and Index-Errors.

$+0\cdot038\ s_1$	$+0\cdot022\ \pi$	$+0\cdot026\ \alpha$	$+0\cdot007\ \alpha'$	$+0\cdot058\ \delta$	$+0\cdot016\ \delta'$	$= +0''\cdot008$	$+0\cdot180$ P.	
$+0\cdot038\ p_1$	$+0\cdot054$	$+0\cdot053$	$+0\cdot015$	$-0\cdot030$	$-0\cdot008$	$+0\cdot021$		
$+0\cdot064\ s_2$	$+0\cdot062$	$-0\cdot002$	$-0\cdot000$	$+0\cdot075$	$+0\cdot038$	$-0\cdot050$	$+0\cdot320$ F.	
$+0\cdot037\ s_3$	$-0\cdot007$	$+0\cdot012$	$+0\cdot006$	$+0\cdot038$	$+0\cdot021$	$+0\cdot004$	$+0\cdot180$ E.	
$+0\cdot036\ p_2$	$+0\cdot024$	$+0\cdot033$	$+0\cdot018$	$+0\cdot004$	$+0\cdot002$	$-0\cdot051$		
$+0\cdot032\ s_4$	$+0\cdot020$	$-0\cdot036$	$-0\cdot030$	$+0\cdot010$	$+0\cdot010$	$+0\cdot037$	$+0\cdot160$ E.	
$+0\cdot032\ p_4$	$-0\cdot026$	$+0\cdot010$	$+0\cdot09$	$+0\cdot038$	$+0\cdot033$	$-0\cdot102$		

Normals for π, α, α', δ and δ'.

$+4\cdot034\ \pi$	$+1\cdot858\ \alpha$	$+0\cdot432\ \alpha'$	$-1\cdot743\ \delta$	$-0\cdot920\ \delta'$	$= -0''\cdot053$	$-0\cdot163$ E.	$-0\cdot226$ F.	$+0\cdot049$ P.
$+1\cdot858\ \alpha$	$+5\cdot541$	$+3\cdot022$	$+1\cdot481$	$+0\cdot765$	$-1\cdot828$	$-0\cdot081$	$-0\cdot340$	$-0\cdot392$
$+0\cdot432$	$+3\cdot022$	$+1\cdot891$	$+0\cdot765$	$+0\cdot397$	$-0\cdot971$	$-0\cdot012$	$-0\cdot181$	$-0\cdot110$
$-1\cdot743$	$+1\cdot481$	$+0\cdot765$	$+6\cdot702$	$+3\cdot649$	$-1\cdot791$	$+0\cdot028$	$-0\cdot421$	$+0\cdot082$
$-0\cdot920$	$+0\cdot765$	$+0\cdot397$	$+3\cdot649$	$+2\cdot270$	$-0\cdot967$	$+0\cdot094$	$-0\cdot213$	$-0\cdot131$

which furnish the final equation :

$$+1\cdot147\ \pi = +0''\cdot140 \quad +0\cdot045\ \text{E.} \quad -0\cdot206\ \text{F.} \quad +0\cdot238\ \text{P.}$$

Group G.—Epoch, October 25·0.

Distances and Angles from + 22°·347 :

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.
1	Oct. 26·26	$-0\cdot358\ \pi + 0\cdot376\ \alpha + 0\cdot476\ \alpha' + 0\cdot913\ \delta + 1\cdot155\ \delta' = -0''\cdot296 + 0\cdot952$ P.	2	0·9
2	Leipzig.	$+0\cdot838 + 0\cdot842 + 1\cdot021 - 0\cdot408 - 0\cdot514 - 0\cdot003$	2	0·9
3	Oct. 26·53	$+0\cdot690\ \pi + 0\cdot254\ \alpha + 0\cdot387\ \alpha' + 0\cdot961\ \delta + 1\cdot460\ \delta' - 0\cdot332 + 1\cdot123$ G.	4	1·6
4	Cape.	$-0\cdot681 + 0\cdot890 + 1\cdot376 - 0\cdot262 - 0\cdot405 + 0\cdot164$	2	0·8
5	Oct. 27·51 Cape.	$+0\cdot877\ \pi - 0\cdot679 - 1\cdot718\ \alpha' + 0\cdot679\ \delta + 1\cdot718\ \delta' + 0\cdot270 + 1\cdot726$ F.	2	1·1

Normals for π, α, α', δ and δ'.

$+2\cdot726\ \pi$	$-0\cdot345\ \alpha$	$-1\cdot365\ \alpha'$	$+1\cdot255\ \delta$	$+2\cdot730\ \delta'$	$= -0''\cdot101$	$+1\cdot666$ F.	$+1\cdot241$ G.	$-0\cdot307$ P.
$-0\cdot345$	$+2\cdot010$	$+3\cdot355$	$-0\cdot303$	$-0\cdot977$	$-0\cdot320$	$-1\cdot290$	$+0\cdot456$	$+0\cdot322$
$-1\cdot365$	$+3\cdot355$	$+6\cdot142$	$-0\cdot960$	$-2\cdot766$	$-0\cdot664$	$-3\cdot264$	$+0\cdot696$	$+0\cdot408$
$+1\cdot255$	$-0\cdot303$	$-0\cdot960$	$+2\cdot940$	$+4\cdot751$	$-0\cdot585$	$+1\cdot290$	$+1\cdot728$	$+0\cdot781$
$+2\cdot730$	$-0\cdot977$	$-2\cdot766$	$+4\cdot751$	$+8\cdot226$	$-0\cdot623$	$+3\cdot264$	$+2\cdot623$	$+0\cdot990$

whence :

$$+1\cdot173\ \pi = -0''\cdot236 \quad -0\cdot330\ \text{F.} \quad +0\cdot551\ \text{G.} \quad -0\cdot308\ \text{P.}$$

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Group H.—Epoch, October 29·5.

Double Distances from + 22°·331 and + 20°·404 :

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Oct. 28·26	+0·408 s_1	+0·790 π	−1·000 κ	+1·240 κ'	−1·538 κ'' =	+0·200	+0·245 P.	4	1·2	0·951
2	Leipzig.	+0·530	−0·854	+1·000	−1·240	+1·538	+0·087	+0·189	4	1·2	0·970
3	Oct. 28·64	+0·402 s_2	+0·405 π	−1·000 κ	+0·860 κ'	−0·740 κ''	−0·021	+0·248 E.	6	1·1	0·969
4	Yale.	+0·536	−0·440	+1·000	−0·860	+0·740	−0·105	+0·187	6	1·1	0·982
5	Oct. 29·50	+0·388 s_3	−0·746 π	−1·000 κ	+0·000 κ'	−0·000 κ''	−0·169	+0·257 G.	1	0·7	0·996
6	Cape.	+0·550	+0·837	+1·000	−0·000	+0·000	−0·349	+0·182	1	0·7	0·998
7	Oct. 29·53	+0·390 s_4	+0·819 π	−1·000 κ	−0·030 κ'	−0·001 κ''	−0·152	+0·256 E.	6	1·1	0·997
8	Yale.	+0·549	−0·804	+1·000	+0·030	+0·001	−0·537	+0·182	6	1·1	0·998
9	Oct. 30·46	+0·376 s_5	+0·497 π	−1·000 κ	−0·960 κ'	−0·922 κ''	+1·349	+0·266 S.	2	0·6	0·992
10	Oxford.	+0·563	−0·407	+1·000	+0·960	+0·922	+1·339	+0·178	2	0·6	0·996
11	Oct. 30·50	+0·374 s_6	−0·869 π	−1·000 κ	−1·000 κ'	−1·000 κ''	−0·322	+0·268 F.	4	1·6	0·991
12	Cape.	+0·565	+0·805	+1·000	+1·000	+1·000	−0·480	+0·177	4	1·6	0·996
13	Oct. 30·53	+0·375 s_7	+0·767 π	−1·000 κ	−1·030 κ'	−1·061 κ''	−0·062	+0·267 E.	6	1·1	0·990
14	Yale.	+0·564	−0·802	+1·000	+1·030	+1·061	−0·341	+0·177	6	1·1	0·996

Normals for Scale-Values.

+ 0·536 s_1	− 0·157 π	+ 0·146 κ	− 0·181 κ'	+ 0·224 κ'' =	+ 0·154	+ 0·240 P.
0·494 s_2	− 0·080	+ 0·147	− 0·126	+ 0·110	− 0·070	+ 0·220 E.
0·317 s_3	+ 0·120	+ 0·113	− 0·000	+ 0·000	− 0·181	+ 0·140 G.
0·498 s_4	− 0·134	+ 0·175	+ 0·004	+ 0·000	− 0·389	+ 0·220 E.
0·275 s_5	− 0·025	+ 0·112	+ 0·107	+ 0·104	+ 0·757	+ 0·120 S.
0·734 s_6	+ 0·208	+ 0·306	+ 0·306	+ 0·306	− 0·626	+ 0·320 F.
0·505 s_7	− 0·180	+ 0·208	+ 0·214	+ 0·220	− 0·236	+ 0·220 E.

Normals for π, κ, κ', κ''.

+ 7·930 π	− 3·101 κ	+ 3·498 κ'	− 3·293 κ'' =	+ 0″·677	+ 0·340 E.	− 0·232 F.	− 0·081 G.	+ 0·109 P.	+ 0·047 S.
− 3·101	+14·355	+ 1·642	+11·611	− 1·112	− 0·477	− 0·276	− 0·102	− 0·133	− 0·102
+ 3·498	+ 1·642	+11·607	+ 0·524	− 0·237	− 0·080	− 0·276	− 0·000	+ 0·165	− 0·097
− 3·293	+11·611	+ 0·524	+13·196	− 0·831	− 0·299	− 0·276	− 0·000	− 0·203	− 0·094

from which we derive, by eliminating κ, κ' and κ''.

$$+ 5·890\,\pi = + 0''·482 + 0·256\ \text{E.} - 0·219\ \text{F.} - 0·096\ \text{G.} + 0·008\ \text{P.} + 0·054\ \text{S.}$$

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Group I.—Epoch, October 31·5.

Double Distances from + 22°·329 and + 20°·404 :

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.	Factor.
1	Oct. 31·51	+ 0·434 s_1 − 0·802 π − 1·000 κ = + 0·200 + 0·230 G.	3	1·1	1·000
2	Cape.	+ 0·595 + 0·795 + 1·000 + 0·400 + 0·168	3	1·1	1·000
3	Oct. 31·52	+ 0·436 s_2 + 0·833 π − 1·000 κ + 0·060 + 0·229 E.	6	1·1	1·000
4	Yale.	+ 0·593 − 0·827 + 1·000 − 0·227 + 0·168	6	1·1	1·000

Normals for Scale-Values.

+ 0·596 s_1 + 0·137 π + 0·177 κ = + 0″·357 + 0·220 G.
+ 0·596 s_2 − 0·140 + 0·173 − 0·120 + 0·220 E.

Normals for π and κ.

+ 2·853 π − 0·069 κ = + 0″·326 + 0·109 E. − 0·107 G.
− 0·069 + 4·296 − 0·166 − 0·131 − 0·133

whence :

2·852 π = + 0″·323 + 0·107 E. − 0·109 G.

Group J.—Epoch, November 2·0.

Double Distances from + 22°·329 and + 20°·388 :

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.	Factor.
1	Nov. 1·53	+ 0·412 s_1 + 0·757 π − 1·000 κ + 0·470 κ' = − 0·071 + 0·243 E.	6	1·1	0·984
2	Yale.	+ 0·335 − 0·638 + 1·000 − 0·470 − 0·324 + 0·299	6	1·1	0·975
3	Nov. 2·51	+ 0·418 s_2 − 0·911 π − 1·000 κ − 0·510 κ' − 0·200 + 0·240 G.	4	2·4	1·000
4	Cape.	+ 0·331 + 0·909 + 1·000 + 0·510 − 0·185 + 0·302	4	2·4	1·000
5	Nov. 2·51	+ 0·420 s_3 + 0·774 π − 1·000 κ − 0·510 κ' − 0·142 + 0·238 E.	4	0·9	1·000
6	Yale.	+ 0·329 − 0·783 + 1·000 + 0·510 − 0·065 + 0·304	4	0·9	1·000

Normals for Scale-Values.

+ 0·310 s_1 + 0·108 π − 0·085 κ + 0·041 κ' = − 0″·151 + 0·220 E.
+ 0·678 s_2 − 0·192 − 0·208 − 0·108 − 0·345 + 0·480 G.
+ 0·256 s_3 + 0·061 − 0·082 − 0·041 − 0·072 + 0·180 E.

Normals for π, κ, κ'.

+ 6·054 π + 1·421 κ + 2·197 κ' = + 0″·121 − 0·106 E. + 0·274 G.
+ 1·421 + 8·687 + 2·297 − 0·342 + 0·239 + 0·298
+ 2·197 + 2·297 + 2·173 + 0·138 − 0·001 + 0·154

whence :

3·703 π = − 0″·088 − 0·073 E. + 0·137 G.

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Group K.—Epoch, November 3·5.

Double Distances from $+21^{\circ}\cdot317$ and $+20^{\circ}\cdot388$:

No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.	Factor.
1	Nov. 3·51	$+0\cdot340\,s_1 \quad -0\cdot886\,\pi \quad -1\cdot000\,\kappa = +0''\cdot420 \quad +0\cdot294\,F.$	2	1·1	1·000
2	Cape.	$+0\cdot335 \quad +0\cdot886 \quad +1\cdot000 \quad +0\cdot425 \quad +0\cdot298$	2	1·1	1·000
3	Nov. 3·51	$+0\cdot342\,s_2 \quad +0\cdot828 \quad -1\cdot000\,\kappa \quad +0\cdot006 \quad +0\cdot292\,E.$	8	1·2	1·000
4	Yale.	$+0\cdot338 \quad -0\cdot829 \quad +1\cdot000 \quad +0\cdot052 \quad +0\cdot296$	8	1·2	1·000

Normals for Scale-Values.

$$+0\cdot251\,s_1 \quad -0\cdot004\,\pi \quad -0\cdot005\,\kappa = +0''\cdot313 \quad +0\cdot220\,F.$$
$$+0\cdot274\,s_2 \quad +0\cdot008 \quad -0\cdot011 \quad +0\cdot023 \quad +0\cdot240\,E.$$

Normals for π and κ.

$$+3\cdot375\,\pi \quad -0\cdot039\,\kappa = -0''\cdot036 \quad -0\cdot005\,E. \quad +0\cdot005\,F.$$
$$-0\cdot039 \quad +4\cdot600 \quad +0\cdot067 \quad +0\cdot005 \quad +0\cdot004$$

whence:

$$+3\cdot375\,\pi = -0''\cdot035 \quad -0\cdot005\,E. \quad +0\cdot005\,F.$$

Group L.—Epoch, November 5·5.

Distances and Angles from $+21^{\circ}\cdot321$:

No.	Date, Observatory.	Reduced Equations of Conditions.	Meas.	Wt.
1	Nov. 4·50 Cape.	$-0\cdot799\,\pi \quad -0\cdot020\,a \quad +0\cdot020\,a' \quad -0\cdot999\,\delta \quad +1\cdot004\,\delta' = +0''\cdot541$	2	0·4
2	Nov. 5·23	$+0\cdot878\,\pi \quad +0\cdot810\,a \quad -0\cdot227\,a' \quad -0\cdot492\,\delta \quad +0\cdot137\,\delta' \quad -0\cdot437 \quad +1\cdot148\,P.$	2	0·9
3	Leipzig.	$+0\cdot275 \quad -0\cdot467 \quad +0\cdot126 \quad -0\cdot867 \quad +0\cdot254 \quad +0\cdot651$	2	0·9
4	Nov. 5·50 Cape.	$-0\cdot861\,\pi \quad +0\cdot665\,a \quad -0\cdot003\,a' \quad -0\cdot701\,\delta \quad +0\cdot003\,\delta' \quad -0\cdot522 \quad +1\cdot250\,G.$	10	2·3
5	Nov. 6·47 Cape.	$-0\cdot812\,\pi \quad -0\cdot036\,a \quad -0\cdot035\,a' \quad -0\cdot999\,\delta \quad -0\cdot966\,\delta' \quad -0\cdot030 \quad +0\cdot927\,F.$	4	1·6

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Normals for π, a, a', δ and δ'.

$+3{\cdot}778\,\pi$	$-0{\cdot}738\,a$	$-0{\cdot}103\,a'$	$+2{\cdot}402\,\delta$	$+1{\cdot}093\,\delta'$	$=+0''{\cdot}716$	$-1{\cdot}203$ F.	$-2{\cdot}473$ G.	$+0{\cdot}908$ P.
$-0{\cdot}738$	$+1{\cdot}805$	$-0{\cdot}221$	$-1{\cdot}000$	$+0{\cdot}055$	$-1{\cdot}393$	$-0{\cdot}053$	$+1{\cdot}910$	$-0{\cdot}837$
$-0{\cdot}103$	$-0{\cdot}221$	$+0{\cdot}063$	$+0{\cdot}056$	$+0{\cdot}060$	$+0{\cdot}175$	$-0{\cdot}043$	$+0{\cdot}000$	$+0{\cdot}004$
$+2{\cdot}402$	$-1{\cdot}000$	$+0{\cdot}056$	$+4{\cdot}019$	$+0{\cdot}895$	$+0{\cdot}360$	$-1{\cdot}480$	$-2{\cdot}012$	$-0{\cdot}509$
$+1{\cdot}093$	$+0{\cdot}055$	$+0{\cdot}060$	$+0{\cdot}895$	$+1{\cdot}963$	$+0{\cdot}341$	$-1{\cdot}417$	$+0{\cdot}009$	$+0{\cdot}141$

giving the final equation for π:

$$+1{\cdot}114\,\pi = +0''{\cdot}060 \quad -0{\cdot}209\,\text{F.} \quad -0{\cdot}128\,\text{G.} \quad -1{\cdot}096\,\text{P.}$$

Group M.—Epoch, November 8·5.

Double Distances from Stars + 21°·304 and + 19°·340:

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Nov. 7·22	$+0{\cdot}465\,s_1$	$+0{\cdot}880\,\pi$	$-1{\cdot}000\,\kappa$	$+1{\cdot}280\,\kappa'$	$-1{\cdot}638\,\kappa''$	$=-0''{\cdot}120$	$+0{\cdot}215$ P.	2	0·9	0·961
2	Leipzig.	$+0{\cdot}552$	$-0{\cdot}691$	$+1{\cdot}000$	$-1{\cdot}280$	$+1{\cdot}638$	$-1{\cdot}001$	$+0{\cdot}181$	2	0·9	0·972
3	Nov. 7·50	$+0{\cdot}473\,s_2$	$-0{\cdot}883\,\pi$	$-1{\cdot}000\,\kappa$	$+1{\cdot}000\,\kappa'$	$-1{\cdot}000\,\kappa''$	$-0{\cdot}095$	$+0{\cdot}212$ G.	6	3·0	0·973
4	Cape.	$+0{\cdot}544$	$+0{\cdot}803$	$+1{\cdot}000$	$-1{\cdot}000$	$+1{\cdot}000$	$-0{\cdot}532$	$+0{\cdot}184$	6	3·0	0·979
5	Nov. 7·50	$+0{\cdot}476\,s_3$	$+0{\cdot}728\,\pi$	$-1{\cdot}000\,\kappa$	$+1{\cdot}000\,\kappa'$	$-1{\cdot}000\,\kappa''$	$+0{\cdot}105$	$+0{\cdot}210$ E.	8	1·2	0·973
6	Yale.	$+0{\cdot}542$	$-0{\cdot}520$	$+1{\cdot}000$	$-1{\cdot}000$	$+1{\cdot}000$	$-0{\cdot}172$	$+0{\cdot}185$	8	1·2	0·979
7	Nov. 8·23	$+0{\cdot}502\,s_4$	$+0{\cdot}849\,\pi$	$-1{\cdot}000\,\kappa$	$+0{\cdot}270\,\kappa'$	$-0{\cdot}073\,\kappa''$	$-0{\cdot}214$	$+0{\cdot}199$ P.	4	1·2	0·993
8	Leipzig.	$+0{\cdot}515$	$-0{\cdot}756$	$+1{\cdot}000$	$-0{\cdot}270$	$+0{\cdot}073$	$-0{\cdot}891$	$+0{\cdot}194$	4	1·2	0·993
9	Nov. 9·22	$+0{\cdot}539\,s_5$	$+0{\cdot}792\,\pi$	$-1{\cdot}000\,\kappa$	$-0{\cdot}720\,\kappa'$	$-0{\cdot}518\,\kappa''$	$-0{\cdot}142$	$+0{\cdot}186$ P.	4	1·2	1·000
10	Leipzig.	$+0{\cdot}479$	$-0{\cdot}810$	$+1{\cdot}000$	$+0{\cdot}720$	$+0{\cdot}518$	$-0{\cdot}647$	$+0{\cdot}209$	4	1·2	1·000
11	Nov. 9·46	$+0{\cdot}546\,s_6$	$-0{\cdot}860\,\pi$	$-1{\cdot}000\,\kappa$	$-0{\cdot}960\,\kappa'$	$-0{\cdot}922\,\kappa''$	$-0{\cdot}167$	$+0{\cdot}183$ G.	3	1·1	0·999
12	Cape.	$+0{\cdot}471$	$+0{\cdot}866$	$+1{\cdot}000$	$+0{\cdot}960$	$+0{\cdot}922$	$-0{\cdot}404$	$+0{\cdot}212$	2	1·1	0·998

Normals for Scale-Values.

$+0{\cdot}468\,s_1$	$+0{\cdot}025\,\pi$	$+0{\cdot}079\,\kappa$	$-0{\cdot}101\,\kappa'$	$+0{\cdot}129\,\kappa''$	$=-0''{\cdot}547$	$+0{\cdot}180$ P.
$+1{\cdot}558\,s_2$	$+0{\cdot}057$	$+0{\cdot}213$	$-0{\cdot}213$	$+0{\cdot}213$	$-1{\cdot}003$	$+0{\cdot}600$ G.
$+0{\cdot}624\,s_3$	$+0{\cdot}077$	$+0{\cdot}079$	$-0{\cdot}079$	$+0{\cdot}079$	$-0{\cdot}052$	$+0{\cdot}240$ E.
$+0{\cdot}620\,s_4$	$+0{\cdot}042$	$+0{\cdot}017$	$-0{\cdot}005$	$+0{\cdot}001$	$-0{\cdot}679$	$+0{\cdot}240$ P.
$+0{\cdot}624\,s_5$	$+0{\cdot}046$	$-0{\cdot}073$	$-0{\cdot}051$	$-0{\cdot}038$	$-0{\cdot}463$	$+0{\cdot}240$ P.
$+0{\cdot}571\,s_6$	$-0{\cdot}067$	$-0{\cdot}083$	$-0{\cdot}080$	$-0{\cdot}075$	$-0{\cdot}308$	$+0{\cdot}220$ G.

Normals for π, κ, κ', κ''.

$+11{\cdot}063\,\pi$	$+0{\cdot}163\,\kappa$	$-0{\cdot}778\,\kappa'$	$+1{\cdot}819\,\kappa''$	$=+0''{\cdot}673$	$+0{\cdot}038$ E.	$-0{\cdot}089$ G.	$-0{\cdot}000$ P.
$+0{\cdot}163$	$+17{\cdot}128$	$-7{\cdot}474$	$+14{\cdot}710$	$-3{\cdot}960$	$-0{\cdot}060$	$-0{\cdot}099$	$-0{\cdot}018$
$-0{\cdot}778$	$-7{\cdot}474$	$+14{\cdot}718$	$-9{\cdot}333$	$+1{\cdot}845$	$+0{\cdot}060$	$+0{\cdot}225$	$+0{\cdot}117$
$+1{\cdot}819$	$+14{\cdot}710$	$-9{\cdot}333$	$+15{\cdot}665$	$-3{\cdot}326$	$-0{\cdot}060$	$-0{\cdot}105$	$-0{\cdot}073$

which furnish

$$+10{\cdot}038\,\pi = +0''{\cdot}661 \quad +0{\cdot}040\,\text{E.} \quad -0{\cdot}094\,\text{G.} \quad +0{\cdot}026\,\text{P.}$$

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Group N.—Epoch, November 12·0.

Double Distances from $+20^{\circ}\cdot341$ and $+19^{\circ}\cdot340$.

No	Date, Observatory.	Reduced Equations of Condition.								Meas.	Wt.	Factor.
1	Nov. 10·20	$+0\cdot360\,s_1$	$+0\cdot738\,\pi$	$-1\cdot000\,\kappa$	$+1\cdot800\,\kappa'$	$-3\cdot240\,\kappa''$	$=-0\cdot919$	$+0\cdot278$	P.	3	1·1	0·909
2	Leipzig.	$+0\cdot418$	$-0\cdot837$	$+1\cdot000$	$-1\cdot800$	$+3\cdot240$	$-0\cdot112$	$+0\cdot239$		3	1·1	0·930
3	Nov. 10·49	$+0\cdot358\,s_2$	$-0\cdot665\,\pi$	$-1\cdot000\,\kappa$	$+1\cdot510\,\kappa'$	$-2\cdot280\,\kappa''$	$-0\cdot899$	$+0\cdot279$	F.	4	1·6	0·930
4	Cape.	$+0\cdot421$	$+0\cdot862$	$+1\cdot000$	$-1\cdot510$	$+2\cdot280$	$-0\cdot095$	$+0\cdot238$		4	1·6	0·947
5	Nov. 10·78	$+0\cdot358\,s_3$	$+0\cdot302\,\pi$	$-1\cdot000\,\kappa$	$+1\cdot220\,\kappa'$	$-1\cdot488\,\kappa''$	$-0\cdot842$	$+0\cdot279$	E.	4	0·9	0·949
6	Yale.	$+0\cdot422$	$-0\cdot086$	$+1\cdot000$	$-1\cdot220$	$+1\cdot488$	$+0\cdot010$	$+0\cdot237$		4	0·9	0·963
7	Nov. 11·22	$+0\cdot357\,s_4$	$+0\cdot830\,\pi$	$-1\cdot000\,\kappa$	$+0\cdot780\,\kappa'$	$-0\cdot608\,\kappa''$	$-0\cdot848$	$+0\cdot280$	P.	4	1·2	0·973
8	Leipzig.	$+0\cdot423$	$-0\cdot881$	$+1\cdot000$	$-0\cdot780$	$+0\cdot608$	$-0\cdot147$	$+0\cdot236$		4	1·2	0·981
9	Nov. 11·48	$+0\cdot354\,s_5$	$-0\cdot761\,\pi$	$-1\cdot000\,\kappa$	$+0\cdot520\,\kappa'$	$-0\cdot270\,\kappa''$	$-0\cdot635$	$+0\cdot283$	G.	2	0·7	0·984
10	Cape.	$+0\cdot425$	$+0\cdot851$	$+1\cdot000$	$-0\cdot520$	$+0\cdot270$	$-0\cdot168$	$+0\cdot235$		2	0·7	0·989
11	Nov. 11·48	$+0\cdot356\,s_6$	$+0\cdot812\,\pi$	$-1\cdot000\,\kappa$	$+0\cdot520\,\kappa'$	$-0\cdot270\,\kappa''$	$-0\cdot924$	$+0\cdot281$	E.	8	1·2	0·984
12	Yale.	$+0\cdot423$	$-0\cdot792$	$+1\cdot000$	$-0\cdot520$	$+0\cdot270$	$+0\cdot034$	$+0\cdot235$		8	1·2	0·989
13	Nov. 11·76	$+0\cdot355\,s_7$	$-0\cdot151\,\pi$	$-1\cdot000\,\kappa$	$+0\cdot240\,\kappa'$	$-0\cdot058\,\kappa''$	$-0\cdot839$	$+0\cdot282$	E.	4	0·9	0·993
14	Yale.	$+0\cdot425$	$+0\cdot011$	$+1\cdot000$	$-0\cdot240$	$+0\cdot058$	$+0\cdot037$	$+0\cdot235$		4	0·9	0·995
15	Nov. 12·22	$+0\cdot355\,s_8$	$+0\cdot889\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot220\,\kappa'$	$-0\cdot048\,\kappa''$	$-0\cdot670$	$+0\cdot282$	P.	4	1·2	1·000
16	Leipzig.	$+0\cdot425$	$-0\cdot889$	$+1\cdot000$	$+0\cdot220$	$+0\cdot048$	$-0\cdot085$	$+0\cdot235$		4	1·2	1·000
17	Nov. 12·48	$+0\cdot353\,s_9$	$-0\cdot859\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot480\,\kappa'$	$-0\cdot230\,\kappa''$	$-0\cdot434$	$+0\cdot284$	F.	5	2·8	0·999
18	Cape.	$+0\cdot428$	$+0\cdot848$	$+1\cdot000$	$+0\cdot480$	$+0\cdot230$	$+0\cdot220$	$+0\cdot234$		5	2·8	1·000
19	Nov. 12·55	$+0\cdot354\,s_{10}$	$+0\cdot603\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot550\,\kappa'$	$-0\cdot302\,\kappa''$	$-0\cdot518$	$+0\cdot283$	E.	6	1·1	0·999
20	Yale.	$+0\cdot426$	$-0\cdot611$	$+1\cdot000$	$+0\cdot550$	$+0\cdot302$	$+0\cdot130$	$+0\cdot235$		6	1·1	0·999
21	Nov. 12·77	$+0\cdot353\,s_{11}$	$-0\cdot030\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot770\,\kappa'$	$-0\cdot593\,\kappa''$	$-0\cdot519$	$+0\cdot284$	E.	4	0·9	0·995
22	Yale.	$+0\cdot428$	$+0\cdot154$	$+1\cdot000$	$+0\cdot770$	$+0\cdot593$	$+0\cdot334$	$+0\cdot334$		4	0·9	0·997
23	Nov. 13·40	$+0\cdot354\,s_{12}$	$+0\cdot559\,\pi$	$-1\cdot000\,\kappa$	$-1\cdot400\,\kappa'$	$-1\cdot960\,\kappa''$	$+0\cdot558$	$+0\cdot283$	S.	2	0·6	0·978
24	Oxford.	$+0\cdot428$	$-0\cdot425$	$+1\cdot000$	$+1\cdot400$	$+1\cdot960$	$+1\cdot081$	$+0\cdot234$		2	0·6	0·983
25	Nov. 13·47	$+0\cdot352\,s_{13}$	$-0\cdot851\,\pi$	$-1\cdot000\,\kappa$	$-1\cdot470\,\kappa'$	$-2\cdot161\,\kappa''$	$-0\cdot845$	$+0\cdot285$	G.	4	2·4	0·971
26	Cape.	$+0\cdot428$	$+0\cdot751$	$+1\cdot000$	$+1\cdot470$	$+2\cdot161$	$+0\cdot281$	$+0\cdot234$		4	2·4	0·980
27	Nov. 13·47	$+0\cdot353\,s_{14}$	$+0\cdot761\,\pi$	$-1\cdot000\,\kappa$	$-1\cdot470\,\kappa'$	$-2\cdot161\,\kappa''$	$-0\cdot629$	$+0\cdot284$	E.	6	1·1	0·971
28	Yale.	$+0\cdot427$	$-0\cdot809$	$+1\cdot000$	$+1\cdot470$	$+2\cdot161$	$+0\cdot860$	$+0\cdot234$		6	1·1	0·980

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Normals for Scale-Values.

$+0{\cdot}335\,s_1$	$-0{\cdot}092\,\pi$	$+0{\cdot}064\,\kappa$	$-0{\cdot}114\,\kappa'$	$+0{\cdot}207\,\kappa''$	$=-0{\cdot}416$	$+0{\cdot}220$	P.
$+0{\cdot}488\,s_2$	$+0{\cdot}200$	$+0{\cdot}101$	$-0{\cdot}152$	$+0{\cdot}230$	$-0{\cdot}579$	$+0{\cdot}320$	F.
$+0{\cdot}275\,s_3$	$+0{\cdot}065$	$+0{\cdot}058$	$-0{\cdot}070$	$+0{\cdot}086$	$-0{\cdot}267$	$+0{\cdot}180$	E.
$+0{\cdot}367\,s_4$	$-0{\cdot}092$	$+0{\cdot}079$	$-0{\cdot}062$	$+0{\cdot}048$	$-0{\cdot}438$	$+0{\cdot}240$	P.
$+0{\cdot}214\,s_5$	$+0{\cdot}065$	$+0{\cdot}050$	$-0{\cdot}026$	$+0{\cdot}013$	$-0{\cdot}207$	$+0{\cdot}140$	G.
$+0{\cdot}367\,s_6$	$-0{\cdot}055$	$+0{\cdot}080$	$-0{\cdot}042$	$+0{\cdot}022$	$-0{\cdot}378$	$+0{\cdot}240$	E.
$+0{\cdot}276\,s_7$	$-0{\cdot}044$	$+0{\cdot}063$	$-0{\cdot}015$	$+0{\cdot}004$	$-0{\cdot}254$	$+0{\cdot}180$	E.
$+0{\cdot}368\,s_8$	$-0{\cdot}074$	$+0{\cdot}084$	$+0{\cdot}018$	$+0{\cdot}004$	$-0{\cdot}329$	$+0{\cdot}240$	P.
$+0{\cdot}862\,s_9$	$+0{\cdot}168$	$+0{\cdot}210$	$+0{\cdot}101$	$+0{\cdot}049$	$-0{\cdot}165$	$+0{\cdot}560$	F.
$+0{\cdot}337\,s_{10}$	$-0{\cdot}052$	$+0{\cdot}079$	$+0{\cdot}043$	$+0{\cdot}024$	$-0{\cdot}141$	$+0{\cdot}220$	E.
$+0{\cdot}277\,s_{11}$	$+0{\cdot}049$	$+0{\cdot}067$	$+0{\cdot}052$	$+0{\cdot}040$	$-0{\cdot}036$	$+0{\cdot}180$	E.
$+0{\cdot}185\,s_{12}$	$+0{\cdot}010$	$+0{\cdot}044$	$+0{\cdot}062$	$+0{\cdot}087$	$+0{\cdot}397$	$+0{\cdot}120$	S.
$+0{\cdot}748\,s_{13}$	$+0{\cdot}050$	$+0{\cdot}182$	$+0{\cdot}269$	$+0{\cdot}384$	$-0{\cdot}425$	$+0{\cdot}480$	G.
$+0{\cdot}338\,s_{14}$	$-0{\cdot}084$	$+0{\cdot}082$	$+0{\cdot}120$	$+0{\cdot}176$	$+0{\cdot}159$	$+0{\cdot}220$	E.

Normals for π, κ, κ', κ''.

$+18{\cdot}869\,\pi$	$+0{\cdot}632\,\kappa$	$+5{\cdot}358\,\kappa'$	$+2{\cdot}050\,\kappa''$	$=+0{\cdot}150$	$+0{\cdot}234$ E	$-0{\cdot}349$ F	$-0{\cdot}248$ G	$+0{\cdot}253$ P	$+0{\cdot}029$ S.
$+0{\cdot}632$	$+35{\cdot}113$	$+2{\cdot}451$	$+40{\cdot}025$	$+15{\cdot}382$	$-0{\cdot}572$	$-0{\cdot}409$	$-0{\cdot}309$	$-0{\cdot}286$	$-0{\cdot}058$
$+5{\cdot}358$	$+2{\cdot}451$	$+39{\cdot}990$	$-1{\cdot}484$	$+2{\cdot}227$	$-0{\cdot}113$	$+0{\cdot}067$	$-0{\cdot}319$	$+0{\cdot}210$	$-0{\cdot}082$
$+2{\cdot}050$	$+40{\cdot}025$	$-1{\cdot}484$	$+82{\cdot}755$	$+19{\cdot}723$	$-0{\cdot}464$	$-0{\cdot}365$	$-0{\cdot}529$	$-0{\cdot}344$	$-0{\cdot}114$

which give:

$$+18{\cdot}048\,\pi = -0{\cdot}398 \quad +0{\cdot}245\,\mathrm{E} \quad -0{\cdot}360\,\mathrm{F} \quad -0{\cdot}192\,\mathrm{G} \quad +0{\cdot}228\,\mathrm{P} \quad +0{\cdot}043\,\mathrm{S}.$$

Group O.—Epoch, November 15·0.

Comparisons with $+18^\circ{\cdot}283$ and $+20^\circ{\cdot}341$ at Leipzig and Yale only, which afford no result for parallax.

Group P.—Epoch, November 17·0.

Comparisons with $+18^\circ{\cdot}283$ and $+19^\circ{\cdot}329$ at the three Northern Hemisphere stations only.

Group Q.—Epoch, November 20·5.

Single distances and angles from $+18^\circ{\cdot}277$. In order not to have the co-efficients of a', a'', δ', δ'' much larger than the others the unit of time is taken at two days.

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No.	Date, Observatory.	Reduced Equations of Condition.									Meas.	Wt.
1	Nov. 18·20	−0·395 π	+0·354 α	−0·408 α′	+0·467 α″	+0·927 δ	−1·068 δ′	+1·230 δ″	= −0·007	+0·788 P.	2	0·9
2	Leipzig.	+0·788	+0·875	−1·008	+1·160	−0·375	+0·432	−0·495	−0·293		2	0·9
3	Nov. 18·45	+0·688 π	+0·318 α	−0·333 α′	+0·335 α″	+0·942 δ	−0·986 δ′	+0·992 δ″	+0·134	+0·870 F.	2	1·1
4	Cape.	−0·740	+0·894	−0·899	+0·935	−0·322	+0·323	−0·338	−0·031		2	0·8
5	Nov. 19·48	+0·755 π	−0·014 α	+0·007 α′	−0·004 α″	+1·000 δ	−0·520 δ′	+0·260 δ″	+0·255	+1·890 G.	4	1·6
6	Cape.	−0·567	+0·943	−0·471	+0·245	+0·046	−0·022	+0·012	−0·538		2	0·4
7	Nov. 20·43	−0·383 π	−0·933 α	+0·039 α′	−0·001 α″	+0·079 δ	−0·008 δ′	+0·000 δ″	+0·066	+2·941 S.	2	0·6
8	Oxford.	−0·510	+0·075	−0·008	+0·000	+0·987	−0·036	+0·001	+0·130		2	0·6
9	Nov. 20·44	+0·526 π	−0·944 α	+0·012 α′	−0·001 α″	+0·035 δ	−0·000 δ′	+0·000 δ″	−0·023	+2·778 F.	6	2·0
10	Cape.	+0·741	+0·125	−0·006	−0·000	+0·991	−0·044	+0·001	+0·217		8	1·5
11	Nov. 20·46	−0·638 π	−0·945 α	+0·018 α′	−0·000 α″	+0·020 δ	−0·000 δ′	+0·000 δ″	+0·092	+2·890 E.	6	1·1
12	Yale.	−0·473	+0·018	−0·000	−0·000	+1·000	−0·025	+0·000	+0·468		6	1·1
13	Nov. 20·76	+0·683 π	−0·899 α	−0·114 α′	−0·015 α″	−0·308 δ	−0·039 δ′	−0·005 δ″	−0·004	+2·127 E.	4	0·9
14	Yale.	−0·261	−0·289	−0·036	−0·005	+0·951	+0·121	+0·016	−0·064		4	0·9
15	Nov. 21·45	−0·216 π	−0·755 α	−0·359 α′	−0·170 α″	−0·603 δ	−0·286 δ′	−0·135 δ″	−0·108	+1·220 E.	4	0·9
16	Yale.	−0·006	−0·571	−0·271	−0·130	+0·798	+0·379	+0·180	+0·769		4	0·9
17	Nov. 21·75	+0·729 π	−0·719 α	−0·451 α′	−0·282 α″	−0·649 δ	−0·407 δ′	−0·255 δ″	+0·170	+1·000 E.	4	0·9
18	Yale.	+0·020	−0·614	−0·385	−0·240	+0·760	+0·477	+0·297	+0·273		4	0·9
19	Nov. 22·28	+0·270 π	−0·670 α	−0·599 α′	−0·530 α″	−0·706 δ	−0·631 δ′	−0·560 δ″	+0·187	+0·781 F.	4	1·6
20	22·43 Cape.	+0·285	−0·676	−0·652	−0·630	+0·699	+0·675	+0·650	+0·768		2	0·4
21	Nov. 22·45	−0·082 π	−0·652 α	−0·636 α′	−0·620 α″	−0·725 δ	−0·706 δ′	−0·690 δ″	−0·195	+0·730 E.	6	1·1
22	Yale.	−0·795	−0·687	−0·669	−0·652	+0·689	+0·672	+0·655	+0·395		6	1·1
23	Nov. 22·75	+0·713 π	−0·637 α	−0·716 α′	−0·807 α″	−0·740 δ	−0·831 δ′	−0·937 δ″	−0·218	+0·645 E.	4	0·9
24	Yale.	+0·106	−0·701	−0·787	−0·885	+0·673	+0·757	+0·852	+0·589		4	0·9

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Normals for π, a, a', a'', δ, δ', δ''.

$$+7{\cdot}335\,\pi - 1{\cdot}035\,a - 0{\cdot}704\,a' - 0{\cdot}160\,a'' - 0{\cdot}094\,\delta - 2{\cdot}335\,\delta' - 0{\cdot}850\,\delta'' = +0''{\cdot}099 \begin{cases} +0{\cdot}009\ \text{E.} \\ +3{\cdot}923\ \text{F.} \end{cases} \begin{cases} +2{\cdot}280\ \text{G.} \\ -0{\cdot}280\ \text{P.} \\ -0{\cdot}676\ \text{S.} \end{cases}$$

$$-1{\cdot}035 \quad +10{\cdot}329 \quad +1{\cdot}751 \quad +5{\cdot}140 \quad +0{\cdot}781 \quad +0{\cdot}377 \quad +0{\cdot}530 \qquad -1{\cdot}825 \begin{cases} -7{\cdot}146\ \text{E.} \\ -5{\cdot}782\ \text{F.} \end{cases} \begin{cases} -0{\cdot}042\ \text{G.} \\ +0{\cdot}251\ \text{P.} \\ -1{\cdot}646\ \text{S.} \end{cases}$$

$$-0{\cdot}704 \quad +1{\cdot}751 \quad +5{\cdot}139 \quad +0{\cdot}955 \quad +0{\cdot}371 \quad +0{\cdot}556 \quad +0{\cdot}245 \qquad -0{\cdot}779 \begin{cases} -1{\cdot}892\ \text{E.} \\ -0{\cdot}998\ \text{F.} \end{cases} \begin{cases} +0{\cdot}021\ \text{G.} \\ -0{\cdot}289\ \text{P.} \\ +0{\cdot}069\ \text{S.} \end{cases}$$

$$-0{\cdot}160 \quad +5{\cdot}140 \quad +0{\cdot}955 \quad +5{\cdot}180 \quad +0{\cdot}530 \quad +0{\cdot}260 \quad +0{\cdot}422 \qquad -1{\cdot}330 \begin{cases} -1{\cdot}442\ \text{E.} \\ -0{\cdot}344\ \text{F.} \end{cases} \begin{cases} -0{\cdot}012\ \text{G.} \\ +0{\cdot}332\ \text{P.} \\ -0{\cdot}004\ \text{S.} \end{cases}$$

$$-0{\cdot}094 \quad +0{\cdot}781 \quad +0{\cdot}371 \quad +0{\cdot}530 \quad +12{\cdot}413 \quad +1{\cdot}003 \quad +6{\cdot}280 \qquad +3{\cdot}160 \begin{cases} -2{\cdot}784\ \text{E.} \\ +0{\cdot}215\ \text{F.} \end{cases} \begin{cases} +3{\cdot}020\ \text{G.} \\ +0{\cdot}656\ \text{P.} \\ +0{\cdot}139\ \text{S.} \end{cases}$$

$$-2{\cdot}335 \quad +0{\cdot}377 \quad +0{\cdot}556 \quad +0{\cdot}260 \quad +1{\cdot}003 \quad +6{\cdot}360 \quad +0{\cdot}610 \qquad +0{\cdot}867 \begin{cases} -1{\cdot}806\ \text{E.} \\ -1{\cdot}737\ \text{F.} \end{cases} \begin{cases} -1{\cdot}570\ \text{G.} \\ -0{\cdot}756\ \text{P.} \\ -0{\cdot}015\ \text{S.} \end{cases}$$

$$-0{\cdot}850 \quad +0{\cdot}530 \quad +0{\cdot}245 \quad +0{\cdot}422 \quad +6{\cdot}280 \quad +0{\cdot}610 \quad +6{\cdot}152 \qquad +1{\cdot}600 \begin{cases} -1{\cdot}492\ \text{E.} \\ +0{\cdot}260\ \text{F.} \end{cases} \begin{cases} +0{\cdot}785\ \text{G.} \\ +0{\cdot}871\ \text{P.} \\ -0{\cdot}000\ \text{S.} \end{cases}$$

Final Equation for π.

$$+6{\cdot}111\,\pi = +0''{\cdot}198 - 1{\cdot}569\ \text{E.} + 2{\cdot}449\ \text{F.} + 1{\cdot}443\ \text{G.} - 0{\cdot}465\ \text{P.} - 0{\cdot}944\ \text{S.}$$

Group R.—Epoch, November 24·5.

Distances from $+19^{\circ}{\cdot}324$ and $+16^{\circ}{\cdot}247$.

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Nov. 23·45	$+0{\cdot}579\,s_1$	$-0{\cdot}820\,\pi$	$-1{\cdot}000\,\kappa$	$+1{\cdot}050\,\kappa'$	$=$	$-0''{\cdot}641$	$+0{\cdot}172$ G.	2	1·5	0·978
2	Cape.	$+0{\cdot}659$	$+0{\cdot}731$	$+1{\cdot}000$	$-1{\cdot}050$		$+0{\cdot}097$	$+0{\cdot}152$	2	1·5	0·982
3	Nov. 23·49	$+0{\cdot}582\,s_2$	$+0{\cdot}604\,\pi$	$-1{\cdot}000\,\kappa$	$+1{\cdot}010\,\kappa'$		$-0{\cdot}690$	$+0{\cdot}172$ E.	2	0·6	0·978
4	Yale.	$+0{\cdot}656$	$-0{\cdot}450$	$+1{\cdot}000$	$-1{\cdot}010$		$+0{\cdot}039$	$+0{\cdot}152$	2	0·6	0·982
5	Nov. 24·42	$+0{\cdot}620\,s_3$	$-0{\cdot}802\,\pi$	$-1{\cdot}000\,\kappa$	$+0{\cdot}080\,\kappa'$		$-0{\cdot}524$	$+0{\cdot}161$ F.	2	0·9	0·989
6	Cape.	$+0{\cdot}618$	$+0{\cdot}753$	$+1{\cdot}000$	$-0{\cdot}080$		$+0{\cdot}445$	$+0{\cdot}162$	2	0·9	0·989

Normals for Scale-Values.

$$+1{\cdot}153\,s_1 \quad +0{\cdot}010\,\pi \quad +0{\cdot}120\,\kappa \quad -0{\cdot}126\,\kappa' = -0''{\cdot}454 \quad +0{\cdot}300\ \text{G.}$$
$$+0{\cdot}461\,s_2 \quad +0{\cdot}034 \quad +0{\cdot}044 \quad -0{\cdot}045 \quad -0{\cdot}226 \quad +0{\cdot}120\ \text{E.}$$
$$+0{\cdot}690\,s_3 \quad -0{\cdot}029 \quad -0{\cdot}002 \quad +0{\cdot}001 \quad -0{\cdot}045 \quad +0{\cdot}180\ \text{F.}$$

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Normals for π, κ and κ'.

$$\begin{array}{llll} +3{\cdot}234\,\pi & +3{\cdot}088\,\kappa & -1{\cdot}911\,\kappa' & = +1''{\cdot}338 \;+0{\cdot}012\,\text{E.} \;+0{\cdot}001\,\text{F.} \;-0{\cdot}050\,\text{G} \\ +3{\cdot}088 & +5{\cdot}981 & -4{\cdot}487 & +2{\cdot}493 \;-0{\cdot}023 \;+0{\cdot}002 \;-0{\cdot}061 \\ -1{\cdot}911 & -4{\cdot}487 & +4{\cdot}525 & -1{\cdot}754 \;+0{\cdot}023 \;-0{\cdot}000 \;+0{\cdot}066 \end{array}$$

and

$$+1{\cdot}498\,\pi = +0''{\cdot}010 \;+0{\cdot}022\,\text{E.} \;-0{\cdot}001\,\text{F.} \;-0{\cdot}025\,\text{G.}$$

Group S.—Epoch, December 1·0.

Distances and Angles from $+17^{\circ}{\cdot}315$. Unit for $a'\,a''$, $\delta'\,\delta''$ 3 days.

No.	Date, Obsy.	Reduced Equations of Condition.	Meas.	Wt.
1	Nov. 28·44 Cape.	$-0{\cdot}577\,\pi\ +0{\cdot}932\,a\ -0{\cdot}794\,a'\ +0{\cdot}678\,a''\ -0{\cdot}200\,\delta\ +0{\cdot}171\,\delta'\ -0{\cdot}145\,\delta''\ = -0''{\cdot}129$	6	1·4
2	Nov. 29·20	$-0{\cdot}484\,\pi\ +0{\cdot}203\,a\ -0{\cdot}122\,a'\ +0{\cdot}073\,a''\ +0{\cdot}977\,\delta\ -0{\cdot}588\,\delta'\ +0{\cdot}352\,\delta''\ +1{\cdot}025\ +0{\cdot}813$ P.	2	0·9
3	Leipzig.	$+0{\cdot}622\ +0{\cdot}930\ -0{\cdot}559\ +0{\cdot}335\ -0{\cdot}210\ +0{\cdot}128\ -0{\cdot}076\ -0{\cdot}134$	2	0·9
4	Nov. 29·41	$+0{\cdot}660\,\pi\ +0{\cdot}199\,a\ -0{\cdot}107\,a'\ +0{\cdot}056\,a''\ +0{\cdot}978\,\delta\ -0{\cdot}526\,\delta'\ +0{\cdot}275\,\delta''\ +0{\cdot}763\ +0{\cdot}869$ G.	4	1·6
5	Cape.	$-0{\cdot}490\ +0{\cdot}931\ -0{\cdot}489\ +0{\cdot}262\ -0{\cdot}208\ +0{\cdot}109\ -0{\cdot}058\ -0{\cdot}050$	4	1·2
6	Nov. 30·34 Cape.	$+0{\cdot}711\,\pi\ +0{\cdot}246\,a\ -0{\cdot}054\,a'\ +0{\cdot}012\,a''\ +0{\cdot}966\,\delta\ -0{\cdot}213\,\delta'\ +0{\cdot}047\,\delta''\ +0{\cdot}734\ +1{\cdot}315$ F.	4	1·6
7	Nov. 30·48	$-0{\cdot}276\,\pi\ +0{\cdot}269\,a\ -0{\cdot}047\,a'\ +0{\cdot}008\,a''\ +0{\cdot}959\,\delta\ -0{\cdot}167\,\delta'\ +0{\cdot}029\,\delta''\ +0{\cdot}526\ +1{\cdot}450$ H.	4	0·9
8	Yale.	$+0{\cdot}548\ +0{\cdot}914\ -0{\cdot}159\ +0{\cdot}027\ -0{\cdot}282\ +0{\cdot}049\ -0{\cdot}008\ -0{\cdot}410$	4	0·9
9	Dec. 1·45	$-0{\cdot}075\,\pi\ +0{\cdot}528\,a\ +0{\cdot}080\,a'\ +0{\cdot}012\,a''\ +0{\cdot}832\,\delta\ +0{\cdot}125\,\delta'\ +0{\cdot}019\,\delta''\ +0{\cdot}449\ +3{\cdot}034$ H.	4	0·9
10	Yale.	$+0{\cdot}696\ +0{\cdot}793\ +0{\cdot}120\ +0{\cdot}018\ -0{\cdot}555\ -0{\cdot}084\ -0{\cdot}012\ -0{\cdot}772$	4	0·9
11	Dec. 1·76	$-0{\cdot}781\,\pi\ +0{\cdot}719\,a\ +0{\cdot}182\,a'\ +0{\cdot}046\,a''\ +0{\cdot}655\,\delta\ +0{\cdot}166\,\delta'\ +0{\cdot}042\,\delta''\ -0{\cdot}192\ +4{\cdot}545$ H.	4	0·9
21	Yale.	$-0{\cdot}035\ +0{\cdot}624\ +0{\cdot}158\ +0{\cdot}040\ -0{\cdot}755\ -0{\cdot}192\ -0{\cdot}048\ -0{\cdot}540$	4	0·9
13	Dec. 2·40	$-0{\cdot}094\,\pi\ +0{\cdot}849\,a\ +0{\cdot}404\,a'\ -0{\cdot}186\,a''\ -0{\cdot}454\,\delta\ -0{\cdot}216\,\delta'\ -0{\cdot}099\,\delta''\ -0{\cdot}901\ +4{\cdot}765$ F.	6	2·0
14	Cape.	$-0{\cdot}577\ -0{\cdot}358\ -0{\cdot}165\ -0{\cdot}078\ -0{\cdot}927\ -0{\cdot}426\ -0{\cdot}202\ -0{\cdot}549$	6	1·4
15	Dec. 2·45	$+0{\cdot}678\,\pi\ +0{\cdot}825\,a\ +0{\cdot}399\,a'\ +0{\cdot}192\,a''\ -0{\cdot}475\,\delta\ -0{\cdot}242\,\delta'\ -0{\cdot}111\,\delta''\ -0{\cdot}851\ +4{\cdot}348$ H.	4	0·9
16	Yale.	$+0{\cdot}120\ -0{\cdot}477\ -0{\cdot}231\ -0{\cdot}111\ -0{\cdot}865\ -0{\cdot}418\ -0{\cdot}201\ -0{\cdot}422$	4	0·9
17	Dec. 2·75	$-0{\cdot}030\,\pi\ +0{\cdot}624\,a\ +0{\cdot}364\,a'\ +0{\cdot}212\,a''\ -0{\cdot}755\,\delta\ -0{\cdot}440\,\delta'\ -0{\cdot}256\,\delta''\ -0{\cdot}768\ +3{\cdot}330$ H.	4	0·9
18	Yale.	$+0{\cdot}756\ -0{\cdot}720\ -0{\cdot}420\ -0{\cdot}244\ -0{\cdot}654\ -0{\cdot}382\ -0{\cdot}222\ -0{\cdot}145$	4	0·9
19	Dec. 3·20	$+0{\cdot}730\,\pi\ +0{\cdot}479\,a\ +0{\cdot}351\,a'\ +0{\cdot}258\,a''\ -0{\cdot}864\,\delta\ -0{\cdot}634\,\delta'\ -0{\cdot}464\,\delta''\ -0{\cdot}655\ +2{\cdot}178$ P.	2	0·9
20	Leipzig.	$-0{\cdot}102\ -0{\cdot}823\ -0{\cdot}601\ -0{\cdot}442\ -0{\cdot}504\ -0{\cdot}368\ -0{\cdot}270\ +0{\cdot}206$	2	0·9
21	Dec. 3·40 Cape.	$-0{\cdot}759\,\pi\ +0{\cdot}436\,a\ +0{\cdot}349\,a'\ +0{\cdot}279\,a''\ -0{\cdot}889\,\delta\ -0{\cdot}712\,\delta'\ -0{\cdot}569\,\delta\ -0{\cdot}864\ +1{\cdot}924$ G.	7	1·1
22	Dec. 4·44	$+0{\cdot}616\,\pi\ +0{\cdot}346\,a\ +0{\cdot}397\,a'\ +0{\cdot}455\,a''\ -0{\cdot}932\,\delta\ -1{\cdot}069\,\delta'\ -1{\cdot}225\,\delta''\ -0{\cdot}543\ +1{\cdot}100$ H.	4	0·9
23	Yale.	$-0{\cdot}345\ -0{\cdot}890\ -1{\cdot}020\ -1{\cdot}170\ -0{\cdot}362\ -0{\cdot}415\ -0{\cdot}476\ +0{\cdot}347$	4	0·9
24	Dec. 5·18	$+0{\cdot}714\,\pi\ +0{\cdot}330\,a\ +0{\cdot}460\,a'\ +0{\cdot}640\,a''\ -0{\cdot}938\,\delta\ -1{\cdot}307\,\delta'\ -1{\cdot}823\,\delta''\ -0{\cdot}442\ +0{\cdot}841$ P.	2	0·9
25	Leipzig.	$-0{\cdot}251\ -0{\cdot}896\ -1{\cdot}248\ -1{\cdot}740\ -0{\cdot}346\ -0{\cdot}482\ -0{\cdot}672\ +0{\cdot}280$	2	0·9

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Normals for $\pi, \alpha, \alpha', \alpha'', \delta, \delta' \delta''$

$+8\cdot605\,\pi$	$-0\cdot092\,\alpha$	$+0\cdot969\,\alpha'$	$+0\cdot700\,\alpha''$	$+0\cdot517\,\delta$	$-1\cdot555\,\delta'$	$-1\cdot030\,\delta''$	$=+1\cdot125$	$\begin{cases}-5\cdot113\text{ F.} & -0\cdot571\text{ H.}\\ -0\cdot690\text{ G.} & +1\cdot615\text{ P.}\end{cases}$
$-0\cdot092$	$+11\cdot603$	$+2\cdot548$	$+5\cdot570$	$-0\cdot515$	$-0\cdot403$	$-0\cdot490$	$-4\cdot287$	$\begin{cases}+8\cdot607\text{ F.} & +10\cdot174\text{ H.}\\ +1\cdot199\text{ G.} & +1\cdot336\text{ P.}\end{cases}$
$+0\cdot969$	$+2\cdot548$	$+5\cdot660$	$+3\cdot197$	$-0\cdot392$	$-0\cdot497$	$-0\cdot110$	$-2\cdot865$	$\begin{cases}+3\cdot736\text{ F.} & +3\cdot949\text{ H.}\\ +0\cdot589\text{ G.} & +0\cdot945\text{ P.}\end{cases}$
$+0\cdot700$	$+5\cdot570$	$+3\cdot197$	$+5\cdot880$	$-0\cdot470$	$-0\cdot083$	$-0\cdot300$	$-2\cdot330$	$\begin{cases}+1\cdot795\text{ F.} & +2\cdot064\text{ H.}\\ +0\cdot675\text{ G.} & +1\cdot044\text{ P.}\end{cases}$
$+0\cdot517$	$-0\cdot515$	$-0\cdot392$	$-0\cdot470$	$+13\cdot686$	$+3\cdot782$	$+5\cdot810$	$+9\cdot555$	$\begin{cases}-2\cdot296\text{ F.} & +1\cdot153\text{ H.}\\ -0\cdot519\text{ G.} & -1\cdot685\text{ P.}\end{cases}$
$-1\cdot555$	$-0\cdot403$	$-0\cdot497$	$-0\cdot083$	$+3\cdot782$	$+5\cdot834$	$+4\cdot570$	$+1\cdot780$	$\begin{cases}-2\cdot511\text{ F.} & -2\cdot516\text{ H.}\\ -2\cdot204\text{ G.} & -2\cdot663\text{ P.}\end{cases}$
$-1\cdot030$	$-0\cdot490$	$-0\cdot110$	$-0\cdot300$	$+5\cdot810$	$+4\cdot570$	$+6\cdot090$	$+3\cdot280$	$\begin{cases}-0\cdot843\text{ F.} & -2\cdot158\text{ H.}\\ -0\cdot834\text{ G.} & -2\cdot035\text{ P.}\end{cases}$

which gives :

$$+7\cdot709\,\pi = +0\cdot580 - 5\cdot241\text{ F.} - 1\cdot412\text{ G.} - 1\cdot295\text{ H.} + 0\cdot744\text{ P.}$$

Group T.—Epoch, December 6·0.

Double Distances from $+17^\circ\cdot315$ and $+16^\circ\cdot247$.

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Dec. 4·41	$+0\cdot088\,s_1$	$-0\cdot758\,\pi$	$-1\cdot000\,\kappa$	$+1\cdot590\,\kappa'$	$-2\cdot528\,\kappa''$	$=-0\cdot897$	$+1\cdot138$ F.	2	0·9	0·997
2	Cape.	$+0\cdot231$	$+0\cdot752$	$+1\cdot000$	$-1\cdot590$	$+2\cdot528$	$+0\cdot499$	$+0\cdot432$	2	0·9	0·999
3	Dec. 5·40	$+0\cdot124\,s_2$	$-0\cdot743\,\pi$	$-1\cdot000\,\kappa$	$+0\cdot600\,\kappa'$	$-0\cdot360\,\kappa''$	$-0\cdot537$	$+0\cdot800$ G.	4	2·0	0·995
4	Cape.	$-0\cdot194$	$+0\cdot749$	$+1\cdot000$	$-0\cdot600$	$+0\cdot360$	$+0\cdot454$	$+0\cdot515$	4	2·0	0·998
5	Dec. 6·18	$+0\cdot154\,s_3$	$+0\cdot704\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot180\,\kappa'$	$-0\cdot032\,\kappa''$	$-0\cdot349$	$+0\cdot645$ P.	4	1·2	0·996
6	Leipzig.	$+0\cdot163$	$-0\cdot737$	$+1\cdot000$	$+0\cdot180$	$+0\cdot032$	$+0\cdot236$	$+0\cdot610$	4	1·2	0·997
7	Dec. 6·37	$+0\cdot160\,s_4$	$-0\cdot714\,\pi$	$-1\cdot000\,\kappa$	$-0\cdot370\,\kappa'$	$-0\cdot137\,\kappa''$	$-0\cdot608$	$+0\cdot620$ F.	1	0·9	0·996
8	Cape.	$+0\cdot158$	$+0\cdot696$	$+1\cdot000$	$+0\cdot370$	$+0\cdot137$	$+0\cdot244$	$+0\cdot628$	2	0·9	0·996
9	Dec. 7·17	$+0\cdot192\,s_5$	$+0\cdot706\,\pi$	$-1\cdot000\,\kappa$	$-1\cdot170\,\kappa'$	$-1\cdot369\,\kappa''$	$-0\cdot386$	$+0\cdot520$ P.	3	1·1	0·998
10	Leipzig.	$+0\cdot127$	$-0\cdot624$	$+1\cdot000$	$+1\cdot170$	$+1\cdot369$	$+0\cdot216$	$+0\cdot780$	3	1·1	0·995
11	Dec. 7·39	$+0\cdot198\,s_6$	$-0\cdot738\,\pi$	$-1\cdot000\,\kappa$	$-1\cdot390\,\kappa'$	$-1\cdot932\,\kappa''$	$-0\cdot401$	$+0\cdot505$ G.	4	2·4	0·998
12	Cape.	$+0\cdot120$	$+0\cdot734$	$+1\cdot000$	$+1\cdot390$	$+1\cdot932$	$-0\cdot100$	$+0\cdot826$	4	2·4	0·995

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Normals for Scale-Values.

+ 0·055 s_1	+ 0·096 π	+ 0·129 κ	− 0·204 κ'	+ 0·325 κ''	=	+ 0″·032	+ 0·180 F.
+ 0·106 s_2	+ 0·106	+ 0·140	− 0·084	+ 0·050		+ 0·042	+ 0·400 G.
+ 0·061 s_3	− 0·014	+ 0·011	+ 0·001	− 0·000		− 0·019	+ 0·240 P.
+ 0·046 s_4	− 0·004	− 0·002	− 0·001	− 0·000		− 0·053	+ 0·180 F.
+ 0·058 s_5	+ 0·063	− 0·071	− 0·084	− 0·098		− 0·052	+ 0·220 P.
+ 0·127 s_6	− 0·139	− 0·187	− 0·259	− 0·363		− 0·161	+ 0·480 G.

Normals for π, κ, κ', κ''.

+ 8·471 π	+ 5·464 κ	− 0·342 κ'	+ 8·558 κ''	= + 2″·676	− 0·789 F.	+ 0·274 G.	− 0·317 P.
+ 5·464	+16·149	+ 5·186	+17·128	+ 6·141	− 1·042	+ 0·392	+ 0·480
− 0·342	+ 5·186	+17·119	+ 8·784	− 0·577	+ 1·684	+ 2·774	+ 0·645
+ 8·558	+17·128	+ 8·784	+30·951	+ 6·493	− 2·672	+ 2·468	+ 0·763

whence :

$$5·487\,\pi = +\,0''·115 \;+\; 0·366\,\text{F.} \;+\; 0·102\,\text{G.} \;-\; 0·454\,\text{P.}$$

Group U.—Epoch, December 11·0.

Single Distances and Position-Angles from +16°·247. Unit for α' α'' δ' δ'' 4 days.

No.	Date, Observatory.	Reduced Equations of Condition.									Meas.	Wt.
1	Dec. 6·36	−0·433 π	−0·416 α	+0·482 α'	−0·560 α''	+0·900 δ	−1·044 δ'	+1·211 δ''	= −1·205	+0·648 S.	2	0
2	Oxford.	−0·421	+0·860	−0·997	+1·156	+0·434	−0·503	+0·584	−0·460		2	0
		Not used, on account of unfavourable circumstances of observation.										
3	Dec. 6·42	−0·665 π	−0·491 α	+0·562 α'	−0·642 α''	+0·858 δ	−0·982 δ'	+1·123 δ''	+0·151	+0·645 E.	4	0·9
4	Yale.	+0·238	+0·820	−0·939	+1·074	+0·514	−0·588	+0·673	+0·058		4	0·9
5	Dec. 6·72	−0·096 π	−0·500 α	+0·535 α'	−0·572 α'	+0·852 δ	−0·912 δ'	+0·975 δ''	−0·198	+0·689 E.	4	0·9
6	Yale.	+0·691	+0·814	−0·871	+0·932	+0·523	−0·558	+0·598	−0·095		4	0·9
7	Dec. 8·17	−0·736 π	−0·492 α	+0·348 α'	−0·246 α''	+0·856 δ	−0·605 δ'	+0·428 δ''	+0·499	+1·100 P.	2	0·9
8	Leipzig.	+0·111	+0·819	−0·579	+0·410	+0·514	−0·364	+0·258	+0·609		2	0·9
9	Dec. 8·39 Cape.	+0·729 π	−0·485 α	+0·314 α'	−0·206 α''	+0·862 δ	−0·563 δ'	+0·367 δ''	+0·053	+1·190 F.	4	1·6
10	Dec. 9·41	−0·428 π	−0·378 α	+0·151 α'	−0·060 α''	+0·918 δ	−0·366 δ'	+0·145 δ''	+0·100	+2·222 S.	2	0
11	Oxford.	−0·313	+0·873	−0·348	+0·138	+0·396	−0·160	+0·061	+0·830		2	0
		Not used, on account of unfavourable circumstances of observation.										1·8
12	Dec. 9·41 Cape.	+0·742 π	−0·375 α	+0·150 α'	−0·059 α''	+0·919 δ	−0·366 δ'	+0·145 δ''	−0·068	+2·126 G.	5	
13	Dec. 10·41	+0·443 π	+0·445 α	−0·069 α'	+0·010 α''	+0·885 δ	−0·137 δ'	+0·019 δ''	+0·310	+5·550 G.	6	2·0
14	Cape.	−0·761	+0·790	−0·111	+0·017	−0·561	+0·099	−0·012	+0·323		8	1·5
15	Dec. 12·46	+0·500 π	+0·854 α	+0·312 α'	+0·014 α''	−0·454 δ	−0·166 δ'	−0·060 δ''	+0·124	+1·179 H.	4	0·9
16	Yale.	+0·180	−0·435	−0·159	−0·058	−0·891	−0·326	−0·119	−0·389		4	0·9

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No.	Date, Observatory.	Reduced Equations of Condition.	Meas.	Wt.
17	Dec. 12·71	$-0·258\,\pi$ $+0·845\,a$ $+0·362\,a'$ $+0·154\,a''$ $-0·470\,\delta$ $-0·201\,\delta'$ $-0·086\,\delta'' = +0·109$ $+1·052$ H.	2	0·6
18	Yale.	$+0·628$ $-0·450$ $-0·193$ $-0·082$ $-0·882$ $-0·378$ $-0·161$ $-0·215$	2	0·6
19	Dec. 13·16	$+0·649\,\pi$ $+0·841\,a$ $+0·455\,a'$ $+0·245\,a''$ $-0·479\,\delta$ $-0·260\,\delta'$ $-0·140\,\delta''$ $+0·395$ $+0·861$ P.	2	0·9
20	Leipzig.	$+0·269$ $-0·459$ $-0·249$ $-0·134$ $-0·878$ $-0·475$ $-0·256$ $-0·042$	2	0·9
21	Dec. 13·43	$+0·604\,\pi$ $+0·839\,a$ $+0·510\,a'$ $+0·310\,a''$ $-0·481\,\delta$ $-0·292\,\delta'$ $-0·177\,\delta''$ $+0·402$ $+0·781$ H.	4	0·9
22	Yale.	$+0·136$ $-0·461$ $-0·280$ $-0·170$ $-0·876$ $-0·532$ $-0·323$ $-0·489$	4	0·9
23	Dec. 13·72	$-0·259\,\pi$ $+0·837\,a$ $+0·570\,a'$ $+0·387\,a''$ $-0·487\,\delta$ $-0·332\,\delta'$ $-0·225\,\delta''$ $+0·012$ $+0·714$ H.	4	0
24	Yale.	$+0·650$ $-0·467$ $-0·318$ $-0·218$ $-0·874$ $-0·595$ $-0·403$ $-0·204$	4	0
		Not used, as no Standards were secured.		

Normals for π, a, a', a'', δ, δ' and δ''.

$$+5·809\,\pi \quad +0·647\,a \quad -0·348\,a' \quad +1·362\,a'' \quad +1·517\,\delta \quad -1·526\,\delta' \quad -0·217\,\delta'' = -0·240 \begin{cases} -0·447 \text{ E.} \\ +1·389 \text{ F.} \end{cases} \begin{cases} +7·762 \text{ G.} \\ +0·794 \text{ H.} \\ -0·222 \text{ P.} \end{cases}$$

$$+0·647 \quad +7·456 \quad -1·456 \quad +3·411 \quad -1·167 \quad +0·662 \quad -0·378 \quad +2·069 \begin{cases} -0·597 \text{ E.} \\ -0·925 \text{ F.} \end{cases} \begin{cases} +3·499 \text{ G.} \\ +2·031 \text{ H.} \\ +0·168 \text{ P.} \end{cases}$$

$$-0·348 \quad -1·456 \quad +3·415 \quad -2·257 \quad +0·652 \quad -0·378 \quad +0·220 \quad +0·375 \begin{cases} +0·660 \text{ E.} \\ +0·598 \text{ F.} \end{cases} \begin{cases} -0·195 \text{ G.} \\ +0·918 \text{ H.} \\ +0·696 \text{ P.} \end{cases}$$

$$+1·362 \quad +3·411 \quad -2·257 \quad +2·980 \quad -0·377 \quad +0·225 \quad -0·135 \quad +0·443 \begin{cases} -0·730 \text{ E.} \\ -0·393 \text{ F.} \end{cases} \begin{cases} -0·116 \text{ G.} \\ +0·436 \text{ H.} \\ -0·051 \text{ P.} \end{cases}$$

$$+1·517 \quad -1·167 \quad +0·652 \quad -0·377 \quad +10·747 \quad -2·699 \quad +4·273 \quad +1·269 \begin{cases} +1·030 \text{ E.} \\ +1·640 \text{ F.} \end{cases} \begin{cases} +13·340 \text{ G.} \\ -1·117 \text{ H.} \\ +0·472 \text{ P.} \end{cases}$$

$$-1·526 \quad +0·662 \quad -0·378 \quad +0·225 \quad -2·699 \quad +4·279 \quad -2·766 \quad -0·289 \begin{cases} -1·138 \text{ E.} \\ -1·072 \text{ F.} \end{cases} \begin{cases} -2·926 \text{ G.} \\ -0·508 \text{ H.} \\ -0·797 \text{ P.} \end{cases}$$

$$-0·217 \quad -0·378 \quad +0·220 \quad -0·135 \quad +4·273 \quad -2·766 \quad +3·435 \quad +0·401 \begin{cases} +1·259 \text{ E.} \\ +0·699 \text{ F.} \end{cases} \begin{cases} +0·768 \text{ G.} \\ -0·241 \text{ H.} \\ +0·314 \text{ P.} \end{cases}$$

whence we get :

$$+2·073\,\pi = -0·618 \quad +0·166 \text{ E.} \quad +0·538 \text{ F.} \quad +1·500 \text{ G.} \quad +0·087 \text{ H.} \quad -0·977 \text{ P.}$$

Group W.—Epoch, October 19·0.

Double distances evening and morning at Yale from $+24°·376$ and $+22°·354$. The star $+24°·376$ is double, as already mentioned. On October 16, Dr. Hall pointed the two stars successively ; on the remaining dates he placed Iris midway between the components. The place of this central point has been derived by adding $-20''·99$ in R.A. and $+1''·59$ in Dec. to the place of $+24°·376$, as given by the heliometer comparison of the two stars. In forming the normals the first observation has not been taken as it is not comparable with the remainder.

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No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Oct. 16·62	+0·252 s_1	−0·087 π	−1·000 κ	+2·580 κ'	−5·664 κ'' =	−0″·343	+0·397 H.	2	0	0·980
2	Yale.	+0·512	+0·259	+1·000	−2·380	+5·664	+1·738	+0·196	2	0	0·990
3	Oct. 17·59	+0·314 s_2	−0·149 π	−1·000 κ	+1·410 κ'	−1·988 κ''	−0·738	+0·318 H.	4	0·9	0·990
4	Yale.	+0·453	+0·305	+1·000	−1·410	+1·988	+0·443	+0·221	4	0·9	0·995
5	Oct. 17·89	+0·335 s_3	+0·761 π	−1·000 κ	+1·110 κ'	−1·232 κ''	−0·640	+0·298 H.	4	0·9	0·992
6	Yale.	+0·432	−0·758	+1·000	−1·110	+1·232	+0·400	+0·231	4	0·9	0·995
7	Oct. 18·57	+0·378 s_4	−0·197 π	−1·000 κ	+0·430 κ'	−0·181 κ''	−0·557	+0·264 H.	4	0·9	0·995
8	Yale.	+0·388	+0·345	+1·000	−0·430	+0·181	+0·388	+0·258	4	0·9	0·995
9	Oct. 18·89	+0·400 s_5	+0·773 π	−1·000 κ	+0·110 κ'	−0·012 κ''	−0·543	+0·250 H.	4	0·9	0·996
10	Yale.	+0·366	−0·769	+1·000	−0·110	+0·012	+0·300	+0·273	4	0·9	0·995
11	Oct. 20·89	+0·540 s_6	+0·820 π	−1·000 κ	−0·890 κ'	−0·792 κ''	+0·015	+0·185 H.	4	0·9	0·999
12	Yale.	+0·226	−0·805	+1·000	+0·890	+0·792	+0·223	+0·443	4	0·9	0·992
13	Oct. 21·62	+0·592 s_7	−0·131 π	−1·000 κ	−1·620 κ'	−2·624 κ''	−0·432	+0·169 H.	4	0·9	0·997
14	Yale.	+0·175	+0·238	+1·000	+1·620	+2·624	−0·064	+0·572	4	0·9	0·988
15	Oct. 21·87	+0·611 s_8	+0·773 π	−1·000 κ	−1·870 κ'	−3·497 κ''	−0·232	+0·164 H.	4	0·9	0·999
16	Yale.	+0·155	−0·753	+1·000	+1·870	+3·497	+0·091	+0·645	4	0·9	0·986

As the equations all have the same weight this has been put unity in deriving the normals, the final equation for π must therefore be multiplied by 0·9.

Normals for Scale-Values.

+ 0·303 s_2	+ 0·091 π	+ 0·139 κ	− 0·198 κ'	+ 0·276 κ''	= − 0″·031	+ 0·200 H.
+ 0·299 s_3	− 0·068	+ 0·097	− 0·109	+ 0·119	− 0·041	+ 0·200
+ 0·293 s_4	+ 0·059	+ 0·010	− 0·005	+ 0·002	− 0·060	+ 0·200
+ 0·293 s_5	+ 0·027	− 0·033	+ 0·004	− 0·000	− 0·107	+ 0·200
+ 0·342 s_6	+ 0·260	− 0·314	− 0·280	− 0·249	+ 0·058	+ 0·200
+ 0·382 s_7	− 0·036	− 0·417	− 0·675	− 1·095	− 0·266	+ 0·200
+ 0·397 s_8	+ 0·357	− 0·456	− 0·852	− 1·596	− 0·128	+ 0·200

Normals for π, κ, κ' and κ''.

+ 4·590 π	− 4·255 κ	− 1·777 κ'	− 5·078 κ''	= − 1″·253	− 0·749 H.
− 4·255	+12·636	+ 0·815	+17·225	+ 4·525	+ 1·480
− 1·777	+ 0·815	+17·231	+ 9·178	− 2·668	+ 3·144
− 5·078	+17·225	+ 9·178	+40·449	+ 4·864	+ 3·939

whence, after multiplying by 0·9, we find:

$$+ 2·586\,\pi = - 0''·001 \quad - 0·032 \text{ H.}$$

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Group X.—Epoch, November 1·0.

Double Distances from + 22°·347 and + 21°·321.

No.	Date, Observatory.	Reduced Equations of Conditions.	Meas.	Wt.	Factor.
1	Oct. 29·57	+0·187 s_1 −0·383 π −1·000 κ +2·430 κ' −5·905 κ'' = +0·099 +0·535 H.	4	0·9	0·987
2	Yale.	+0·597 +0·260 +1·000 −2·430 +5·905 +0·614 +0·167	4	0·9	0·999
3	Oct. 29·84	+0·210 s_2 +0·748 π −1·000 κ +2·160 κ' −4·666 κ'' −0·171 +0·476 H.	4	0·9	0·991
4	Yale.	+0·573 −0·776 +1·000 −2·160 +4·666 +0·639 +0·175	4	0·9	0·999
5	Oct. 30·57	+0·269 s_3 −0·315 π −1·000 κ +1·430 κ' −2·045 κ'' +0·210 +0·372 H.	4	0·9	0·998
6	Yale.	+0·514 +0·254 +1·000 −1·430 +2·045 +0·475 +0·194	4	0·9	0·999
7	Oct. 30·84	+0·293 s_4 +0·769 π −1·000 κ +1·160 κ' −1·346 κ'' +0·212 +0·341 H.	4	0·9	0·999
8	Yale.	+0·491 −0·783 +1·000 −1·160 +1·346 +0·072 +0·203	4	0·9	1·000
9	Oct. 31·56	+0·351 s_5 −0·306 π −1·000 κ +0·440 κ' −0·194 κ'' +0·137 +0·285 H.	4	0·9	1·000
10	Yale.	+0·433 +0·290 +1·000 −0·440 +0·194 +0·480 +0·231	4	0·9	1·000
11	Oct. 31·86	+0·377 s_6 +0·830 π −1·000 κ +0·140 κ' −0·020 κ'' +0·110 +0·265 H.	2	0·3	1·000
12	Yale.	+0·407 −0·834 +1·000 −0·140 +0·020 +0·380 +0·245	1	0·3	1·000
13	Nov. 1·57	+0·435 s_7 −0·250 π −1·000 κ −0·570 κ' −0·325 κ'' +0·690 +0·230 H.	2	0·6	1·000
14	Yale.	+0·349 +0·284 +1·000 +0·570 +0·325 +0·235 +0·286	2	0·6	0·997
15	Nov. 1·84	+0·459 s_8 +0·815 π −1·000 κ −0·840 κ' −0·706 κ'' +0·432 +0·218 H.	4	0·9	1·000
16	Yale.	+0·325 −0·781 +1·000 +0·840 +0·706 +0·235 +0·308	4	0·9	0·999
17	Nov. 3·55	+0·600 s_9 −0·247 π −1·000 κ −2·550 κ' −6·502 κ'' +1·098 +0·167 H.	4	0·9	0·998
18	Yale.	+0·185 +0·412 +1·000 +2·550 +6·502 +0·633 +0·540	4	0·9	0·974

Normals for Scale-Values.

+0·352 s_1	+0·075 π	+0·369 κ	−0·897 κ'	+2·180 κ''	= +0″·347	+0·180 H.
+0·335 s_2	−0·259	+0·327	−0·706	+1·525	+0·297	+0·180
+0·302 s_3	+0·041	+0·220	−0·315	+0·452	+0·271	+0·180
+0·294 s_4	−0·143	+0·178	−0·207	+0·240	+0·087	+0·180
+0·279 s_5	+0·017	+0·073	−0·033	+0·014	+0·230	+0·180
+0·092 s_6	−0·008	+0·009	−0·001	+0·000	+0·059	+0·060
+0·187 s_7	−0·006	−0·052	−0·029	−0·017	+0·230	+0·120
+0·285 s_8	+0·108	−0·121	−0·102	−0·085	+0·247	+0·180
+0·355 s_9	−0·065	−0·373	−0·952	−2·430	+0·698	+0·180

Normals for π, κ, κ' and, κ''.

+4·142 π	− 1·960 κ	+ 2·217 κ'	− 0·420 κ''	= −0″·014	+0·345 H.
−1·960	+12·948	− 6·074	+ 32·020	+0·762	−0·861
+2·217	− 6·074	+32·011	− 18·250	−0·540	+4·538
−0·420	+32·020	−18·250	+152·950	+4·482	−2·544

from which :

$$+3{\cdot}501\ \pi = -0''{\cdot}052 \quad +0{\cdot}027\ \text{H.}$$

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Group Y.—Epoch, November 7·5.

Only one observation of this group was secured.

Group Z.—Epoch, November 15·5.

Double Distances at Yale, East and West, from + 19°·340 and + 19°·324.

No.	Date, Observatory.	Reduced Equations of Condition.							Meas.	Wt.	Factor.
1	Nov. 13·51	+0·417 s_1	−0·727 π	+1·000 κ	−1·990 κ'	+3·960 κ''	= +0·856	+0·239 H.	4	0·9	0·956
2	Yale.	+0·613	+0·558	−1·000	−1·990	−3·960	−0·247	+0·163	4	0·9	0·979
3	Nov. 13·80	+0·428 s_2	+0·329 π	+1·000 κ	−1·700 κ'	+2·890 κ''	+0·591	+0·233 H.	4	0·9	0·969
4	Yale.	+0·601	−0·603	−1·000	+1·700	−2·890	+0·167	+0·167	4	0·9	0·984
5	Nov. 14·52	+0·452 s_3	−0·650 π	+1·000 κ	+0·980 κ'	+0·960 κ''	+0·294	+0·221 H.	4	0·9	0·990
6	Yale.	+0·577	+0·583	−1·000	+0·980	−0·960	−0·047	+0·173	4	0·9	0·994
7	Nov. 16·80	+0·526 s_4	+0·591 π	+1·000 κ	+1·300 κ'	+1·690 κ''	+0·545	+0·190 H.	4	0·9	0·988
8	Yale.	+0·505	−0·397	−1·000	−1·300	−1·690	+0·101	+0·198	4	0·9	0·987
9	Nov. 17·50	+0·544 s_5	−0·518 π	+1·000 κ	+2·000 κ'	+4·000 κ''	+0·490	+0·184 H.	4	0·9	0·975
10	Yale.	+0·487	+0·656	−1·000	−2·000	−4·000	−0·220	+0·205	4	0·9	0·969
11	Nov. 17·78	+0·553 s_6	+0·591 π	+1·000 κ	+2·280 κ'	+5·198 κ''	+0·460	+0·181 H.	4	0·9	0·969
12	Yale	+0·479	−0·274	−1·000	−2·280	+5·198	−0·160	+0·209	4	0·9	0·959

Normals for Scale-Values.

+0·495 s_1	+0·035 π	−0·176 κ	+0·351 κ'	−0·698 κ''	= +0″·185	+0·180 H.
+0·490 s_2	+0·199	−0·156	+0·265	−0·449	+0·318	+0·180
+0·483 s_3	+0·038	−0·112	+0·110	−0·108	+0·095	+0·180
+0·479 s_4	+0·100	+0·019	+0·025	+0·032	+0·304	+0·180
+0·480 s_5	+0·033	+0·051	+0·103	+0·206	+0·144	+0·180
+0·481 s_6	+0·176	+0·067	+0·152	+0·346	+0·160	+0·180

Normals for π, κ, κ' and κ''.

+ 3·160 π	− 0·891 κ	+ 2·787 κ'	− 2·165 κ''	= − 0″·640	− 0·093 H.
− 0·891	+10·646	+ 1·840	+ 33·169	+ 3·416	+ 0·356
+ 2·787	+ 1·840	+33·168	+ 15·573	− 0·277	− 0·755
− 2·165	+33·169	+15·573	+125·734	+11·847	+ 0·506

giving :

$$+ 2·819\,\pi = - 0''·254 \quad + 0·006\,\text{H.}$$

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If we collect and add the final equations just deduced, we arrive at the final normal in π. Taking first those depending on measures of single stars, we get :

Final Equations from "Single Star" Groups.

Group.								
A.	1·303 π	= − 0″·335	+ 0·268 E.	... F.	− 0·277 G.	... H.	... P.	... S.
E.	1·791	− 0·050	+ 1·100	...	− 0·291	...	− 0·492	...
G.	1·173	− 0·236	...	− 0·330	+ 0·551	...	− 0·308	...
L.	1·114	+ 0·060	...	− 0·209	− 0·128	...	− 1·096	...
Q.	6·111	+ 0·190	− 1·569	+ 2·449	+ 1·443	...	− 0·465	− 0·944
S.	7·709	+ 0·580	...	− 5·241	− 1·412	− 1·295	+ 0·744	...
U.	2·073	− 0·618	+ 0·166	+ 0·538	+ 1·500	+ 0·087	− 0·977	...
Sum:	21·274 π	= − 0·401	− 0·035 E.	− 2·793 F.	+ 1·386 G.	− 1·208 H.	− 2·594 P.	− 0·944 S.

The results from the measures of opposite stars lead to the following :—

Final Equations from "Opposite Star" Groups.

Group.								
C.	0·621 π	= + 0″·193	− 0·068 E.	+ 0·027 F.	... G.	... H.	+ 0·022 P.	... S.
D.	4·451	+ 0·150	− 0·062	+ 0·019	+ 0·037	...	...	...
F.	1·147	+ 0·140	+ 0·045	− 0·206	...	...	+ 0·238	...
H.	5·890	+ 0·482	+ 0·256	− 0·219	− 0·096	...	+ 0·008	+ 0·054
I.	2·852	+ 0·323	+ 0·107	...	− 0·109	...	...	...
J.	3·703	− 0·088	− 0·073	...	+ 0·137	...	...	...
K.	3·375	− 0·035	− 0·005	+ 0·005	...	...	...	...
M.	10·038	+ 0·661	+ 0·040	...	− 0·094	...	+ 0·026	...
N.	18·048	− 0·398	+ 0·245	− 0·360	− 0·192	...	+ 0·228	+ 0·043
R.	1·498	+ 0·010	+ 0·022	− 0·001	− 0·025	...	...	...
T.	5·487	+ 0·115	...	+ 0·366	+ 0·102	...	− 0·454	...
W.	2·586	− 0·001	...	...	...	− 0·032	...	...
X.	3·501	− 0·052	...	...	...	+ 0·027	...	...
Z.	2·819	− 0·254	...	...	...	+ 0·006	...	...
Sum:	66·016 π	= + 1·246	+ 0·507 E.	− 0·369 F.	− 0·240 G.	+ 0·001 H.	+ 0·068 P.	+ 0·097 S.

On examining these summed up final equations it will be seen that for the "opposite star" groups, as might have been expected, an error of the form 1/S affects but slightly the final result, and would be almost entirely without effect if this error were constant and of about the same magnitude for each observer. If, in order to get an idea of the amount of its effect on the parallax, we take the values deduced by Dr. Gill for F, G, H, and P, that for E found in the Yale Polar triangulation which are, in round numbers,

$$E. = +0''\cdot30,\quad F. = +0''\cdot15,\quad G. = +0''\cdot10,\quad H. = +0''\cdot15,\quad P. = 0''\cdot00,$$

and assume S. $= 0''\cdot00$, the absolute term of the sum of the "opposite star" groups becomes $+1''\cdot319$, and the resulting parallax is changed but $0''\cdot001$.

On the other hand, these terms are far from balancing out in the sum of the "single star" groups, and the substitution of the above values of E, F, &c. changes the absolute term of the summed up equations to $-0''\cdot873$ and the parallax given by these groups alone by $0''\cdot020$.

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It seems, however, hardly desirable to ignore the results from the "single star" groups altogether, and I therefore propose to combine them with the others with a weight derived on the assumption that the systematic errors E, F, &c. are each affected with a probable error of $\pm 0''\cdot15$. As the weight 21·274 is based on a probable error of $\pm\ 0''\cdot10$ for weight unity, the total probable error of the result from the "single stars" is:

$$\varepsilon = \sqrt{\{(0''\cdot10)^2 : 21\cdot274 + (0''\cdot15)^2\,(0\cdot035^2 + 2\cdot793^2 + 1\cdot386^2 + 1\cdot208^2 + 2\cdot954^2 + 0\cdot944^2) : (21\cdot274)^2\}},$$

and their reduced weight therefore equal to $(0''\cdot10)^2 : \varepsilon^2$ or 7·32, or about one-third of the original weight, whereas that for the "opposite star" group is not sensibly altered by a similar computation. Taking one-third of the summed up equations for the "single star" groups we arrive at a final equation for π:

$$73\cdot107\,\pi = +1''\cdot112 \quad +0\cdot495\,\mathrm{E.} \quad -1\cdot300\,\mathrm{F.} \quad +0\cdot222\,\mathrm{G.} \quad -0\cdot402\,\mathrm{H.} \quad -0\cdot797\,\mathrm{P.} \quad -0\cdot218\,\mathrm{S.}$$

and the right-hand number becomes $+1''\cdot028$ if we adopt the values E, F, &c., as before. This leads to the values

$$\pi = +0''\cdot0152 \text{ or } +0''\cdot0141$$

according as we do not or do include the personal error terms. Under the assumptions made, therefore, the systematic errors have practically cancelled themselves out in the final result. It is probable that the values taken for E, F, &c. are larger than actually occurred for Iris, as these estimations were based on measures of stars probably nearly one magnitude fainter in the mean than the Iris stars. But it may be remarked that if all observers diminished their amount of "swinging through" for brighter stars in the same ratio, this cancellation would be likely to still hold good.

With the value $\pi = +0''\cdot015$ we find the remaining unknowns in the several groups to be as follows, according as we disregard or include the quantities E, F, &c:—

		″	″
Group A.	α =	− 0·155	or + 0·047
	α'	+ 0·185	+ 0·100
	δ	− 0·312	− 0·452
	δ'	+ 0·052	+ 0·023
Group C.	s_1 =	− 0·196	or − 0·127
	s_2	+ 0·095	+ 0·231
	s_3	− 0·192	− 0·053
	s_4	− 0·182	− 0·042
	s_5	+ 0·138	+ 0·138
	s_6	− 0·377	− 0·242
	κ	− 0·370	− 0·340
	κ'	+ 0·066	+ 0·068
	κ''	− 0·034	− 0·049
Group D.	s_1 =	− 0·271	or − 0·205
	s_2	− 0·626	− 0·434
	κ	− 0·340	− 0·335

		″	″
Group E.	α =	+ 0·013	or − 0·376
	α'	+ 0·373	− 0·066
	δ	+ 0·045	− 0·327
	δ'	+ 0·237	− 0·023
Group F.	s_1 =	+ 0·68	or + 0·76
	p_1	+ 0·82	+ 0·79
	s_2	− 0·58	+ 0·20
	s_3	+ 0·38	+ 1·92
	p_3	− 1·14	− 1·10
	s_4	+ 0·94	+ 2·41
	p_4	− 2·87	− 2·92
	α	− 0·334	− 0·325
	α'	+ 0·099	+ 0·081
	δ	− 0·192	− 0·281
	δ'	− 0·015	+ 0·112

		″	″
Group G.	α =	+ 0·103	or − 0·003
	α'	− 0·119	− 0·030
	δ	− 0·846	− 1·363
	δ'	+ 0·380	+ 0·782
Group H.	s_1 =	+ 0·305	or + 0·301
	s_2	− 0·118	+ 0·017
	s_3	− 0·557	+ 0·495
	s_4	− 0·761	− 0·607
	s_5	+ 2·75	+ 2·795
	s_6	− 0·834	− 0·768
	s_7	− 0·427	− 0·294
	κ	− 0·087	− 0·108
	κ'	− 0·015	− 0·016
	κ''	+ 0·019	+ 0·028

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		″	″
Group I.	s_1 =	+ 0·605	or + 0·647
	s_2	− 0·184	− 0·072
	κ	− 0·039	− 0·051

		″	″
Group J.	s_1 =	− 0·519	or − 0·288
	s_2	− 0·513	− 0·410
	s_3	− 0·297	− 0·047
	κ	− 0·075	− 0·035
	κ'	+ 0·123	+ 0·092

		″	″
Group K.	s_1 =	+ 1·25	or + 1·38
	s_2	+ 0·084	+ 0·348
	κ	+ 0·015	+ 0·015

		″	″
Group L.	a =	− 0·997	or − 0·848
	a'	− 0·777	− 0·175
	δ	− 0·233	− 0·281
	δ'	+ 0·326	+ 0·216

		″	″
Group M.	s_1 =	− 1·13	or − 1·13
	s_2	− 0·613	− 0·575
	s_3	− 0·054	+ 0·061
	s_4	− 1·09	− 1·09
	s_5	− 0·769	− 0·770
	s_6	− 0·566	− 0·527
	κ	− 0·251	− 0·253
	κ'	+ 0·020	+ 0·023
	κ''	+ 0·033	+ 0·035

		″	″
Group N.	s' =	− 1·34	or − 1·33
	s_2	− 1·29	− 1·18
	s_3	− 1·06	− 0·87
	s_4	− 1·27	− 1·27
	s_5	− 1·06	− 0·99
	s_6	− 1·11	− 0·91
	s_7	− 1·00	− 0·80
	s_8	− 0·978	− 0·97

		″	″
Group N. *cont.*	s_9	− 0·291	or − 0·191
	s_{10}	− 0·506	− 0·311
	s_{11}	− 0·235	− 0·043
	s_{12}	+ 2·04	+ 2·02
	s_{13}	− 0·702	− 0·640
	s_{14}	+ 0·343	+ 0·535
	κ	+ 0·364	+ 0·356
	κ'	+ 0·033	+ 0·033
	κ''	+ 0·062	+ 0·064

		″	″
Group Q.	a =	− 0·092	or − 0·567
	a'	− 0·118	− 0·152
	a''	− 0·175	+ 0·215
	δ	+ 0·255	+ 0·247
	δ'	+ 0·122	− 0·009
	δ''	+ 0·013	− 0·003

		″	″
Group R.	s_1 =	− 0·434	or − 0·409
	s_2	− 0·530	− 0·451
	s_3	− 0·062	− 0·025
	κ	+ 0·476	+ 0·482
	κ'	+ 0·093	+ 0·099

		″	″
Group S.	a =	− 0·364	or + 0·011
	a'	− 0·448	− 0·202
	a''	+ 0·244	− 0·130
	δ	+ 0·759	+ 0·781
	δ'	− 0·193	− 0·362
	δ''	− 0·064	− 0·026

		″	″
Group T.	s_1 =	− 1·22	or − 0·472
	s_2	− 0·292	+ 0·142
	s_3	− 0·377	− 0·377
	s_4	− 1·15	− 0·543
	s_5	− 0·603	− 0·586
	s_6	− 0·912	− 0·496
	κ	+ 0·390	+ 0·382
	κ'	− 0·170	− 0·131
	κ''	+ 0·037	+ 0·026

		″	″
Group U.	a =	+ 0·463	or + 0·730
	a'	+ 0·063	− 0·042
	a''	− 0·315	− 0·730
	δ	+ 0·195	+ 0·468
	δ'	− 0·102	− 0·460
	δ''	− 0·173	− 0·630

		″	″
Group W.	s_1 =	...	...
	s_2	− 0·393	or − 0·287
	s_3	− 0·318	− 0·214
	s_4	− 0·222	− 0·123
	s_5	− 0·328	− 0·215
	s_6	+ 0·354	+ 0·467
	s_7	− 0·582	− 0·490
	s_8	− 0·267	− 0·106
	κ	+ 0·370	+ 0·379
	κ'	− 0·172	− 0·148
	κ''	+ 0·005	+ 0·009

		″	″
Group X.	s_1 =	+ 0·787	or + 0·920
	s_2	+ 0·760	+ 0·888
	s_3	+ 0·861	+ 0·971
	s_4	+ 0·290	+ 0·395
	s_5	+ 0·832	+ 0·931
	s_6	+ 0·641	+ 0·740
	s_7	+ 1·23	+ 1·33
	s_8	+ 0·871	+ 0·961
	s_9	+ 2·16	+ 2·30
	κ	− 0·025	− 0·023
	κ'	− 0·004	+ 0·018
	κ''	+ 0·034	+ 0·034

		″	″
Group Z.	s_1 =	+ 0·545	or + 0·605
	s_2	+ 0·785	+ 0·838
	s_3	+ 0·247	+ 0·306
	s_4	+ 0·625	+ 0·684
	s_5	+ 0·269	+ 0·320
	s_6	+ 0·277	+ 0·330
	κ	+ 0·097	+ 0·114
	κ'	− 0·051	− 0·053
	κ''	+ 0·075	+ 0·072

The substitution of these values and $\pi = +0''\cdot015$ in the equations of condition, furnishes the following residuals for the two cases under consideration, the arrangement being by class of observation and observer :—

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Elkin.

Single Distances.			Wt.
A. 1	— 0″·071 or	— 0″·015	0·9
A. 3	— 0·070	— 0·074	0·9
A. 5	+ 0·385	+ 0·292	0·9
E. 6	+ 0·185	— 0·089	1·1
E. 8	— 0·125	— 0·045	1·2
Q. 11	— 0·010	— 0·434	1·1
Q. 13	+ 0·031	— 0·177	0·9
Q. 15	+ 0·056	+ 0·039	0·9
Q. 17	— 0·211	— 0·200	0·9
Q. 21	+ 0·067	+ 0·137	1·1
Q. 23	+ 0·210	+ 0·161	0·9
U. 3	— 0·076	— 0·122	0·9
U. 5	+ 0·269	+ 0·228	0·9

Elkin.

Single Position-Angles.			Wt.
A. 2	— 0°·144 or	— 0°·120	0·9
A. 4	— 0·053	— 0·047	0·9
A. 6	+ 0·269	+ 0·242	0·9
E. 7	+ 0·062	+ 0·071	1·1
E. 9	+ 0·181	+ 0·189	1·2
Q. 12	— 0·223	— 0·238	1·1
Q. 14	+ 0·350	+ 0·462	0·9
Q. 16	— 0·410	— 0·240	0·9
Q. 18	+ 0·127	+ 0·263	0·9
Q. 22	+ 0·117	+ 0·106	1·1
Q. 24	— 0·001	— 0·105	0·9
U. 4	— 0·029	— 0·113	0·9
U. 6	+ 0·188	+ 0·179	0·9

Finlay.

Single Distances.			Wt.
G. 5	+ 0°·055 or	— 0°·045	1·1
L. 5	+ 0·002	— 0·013	1·6
Q. 3	— 0·042	— 0·072	1·1
Q. 9	+ 0·124	+ 0·155	2·0
Q. 19	— 0·223	— 0·111	1·6
S. 6	— 0·016	— 0·077	1·6
S. 13	+ 0·143	— 0·193	2·0
U. 9	— 0·023	— 0·004	1·6

Finlay.

Single Position-Angles.			Wt.
L. 1	+ 0°·013 or	— 0°·051	0·4
Q. 4	— 0·164	— 0·231	0·8
Q. 10	+ 0·014	— 0·031	1·5
Q. 20	— 0·248	— 0·253	0·4
S. 1	+ 0·128	— 0·012	1·4
S. 14	+ 0·121	+ 0·015	1·4

Gill.

Single Distances.			Wt.
A. 7	— 0°·288 or	— 0°·232	0·7
E. 4	— 0·134	— 0·039	0·4
G. 3	+ 0·060	+ 0·049	1·6
L. 4	+ 0·017	+ 0·020	2·3
Q. 5	— 0·050	— 0·176	1·6
S. 4	+ 0·057	+ 0·122	1·6
S. 21	+ 0·110	+ 0·140	1·1
U. 12	+ 0·123	+ 0·135	1·8
U. 13	— 0·077	— 0·072	2·0

Gill.

Single Position-Angles.			Wt.
E. 1	— 0°·065 or	— 0°·074	1·2
E. 5	— 0·179	— 0·173	0·6
G. 4	— 0·176	— 0·177	0·8
Q. 6	+ 0·464	+ 0·133	0·4
S. 5	— 0·188	— 0·083	1·2
U. 14	— 0·093	— 0·053	1·5

Hall.

Single Distances.			Wt.
S. 7	+ 0°·153 or	+ 0°·077	0·9
S. 9	— 0·068	— 0·312	0·9
S. 11	+ 0·312	— 0·086	0·9
S. 15	+ 0·121	— 0·167	0·9
S. 17	— 0·042	— 0·251	0·9
S. 22	— 0·066	— 0·058	0·9
U. 15	+ 0·201	+ 0·137	0·9
U. 17	+ 0·198	+ 0·143	0·6
U. 21	— 0·104	— 0·126	0·9

Hall.

Single Position-Angles.			Wt.
S. 8	— 0°·059 or	+ 0°·218	0·9
S. 10	+ 0·039	+ 0·361	0·9
S. 12	— 0·280	— 0·016	0·9
S. 16	+ 0·113	— 0·041	0·9
S. 18	+ 0·137	— 0·102	0·9
S. 23	— 0·019	— 0·124	0·9
U. 16	+ 0·089	— 0·067	0·9
U. 18	— 0·076	— 0·175	0·6
U. 22	+ 0·251	+ 0·330	0·9

Peter.

Single Distances.			Wt.
E. 2	+ 0°·150 or	+ 0°·349	0·9
G. 1	— 0·060	— 0·066	0·9
L. 2	— 0·024	— 0·030	0·9
Q. 1	+ 0·057	+ 0·198	0·9
S. 2	— 0·201	— 0·048	0·9
S. 19	— 0·106	+ 0·133	0·9
S. 24	— 0·060	+ 0·068	0·9
U. 7	— 0·482	— 0·294	0·9
U. 19	— 0·088	+ 0·015	0·9

Peter.

Single Position-Angles.			Wt.
E. 3	— 0°·209 or	— 0°·202	0·9
G. 2	+ 0·130	+ 0·138	0·9
L. 3	— 0·007	+ 0·025	0·9
Q. 2	+ 0·088	+ 0·118	0·9
S. 3	— 0·044	+ 0·012	0·9
S. 20	— 0·040	— 0·293	0·9
S. 25	+ 0·052	+ 0·106	0·9
U. 8	— 0·301	— 0·138	0·9
U. 23	— 0·220	— 0·214	0·9

Stone.

Single Distances.			Wt.
Q. 7	+ 0″·035 or	+ 0″·477	0·6

Stone.

Single Position-Angles.			Wt.
Q. 8	+ 0″·106 or	+ 0″·064	0·6

Elkin.

Double Distances.			Wt.
C. 3	+ 0°·155 or	+ 0°·140	0·9
C. 4	— 0·127	— 0·111	0·9
C. 5	— 0·065	— 0·054	1·1
C. 6	+ 0·056	+ 0·045	1·1
C. 7	+ 0·023	+ 0·035	1·2
C. 8	— 0·019	— 0·032	1·2
C. 11	— 0·036	— 0·053	1·2
C. 12	+ 0·030	+ 0·046	1·2
D. 3	+ 0·016	+ 0·019	1·2
D. 4	— 0·016	— 0·017	1·2
F. 7	— 0·181	— 0·210	0·9
F. 9	+ 0·138	+ 0·174	0·9
F. 11	+ 0·019	+ 0·140	0·8
F. 13	+ 0·010	— 0·137	0·8
H. 3	+ 0·041	+ 0·029	1·1
H. 4	— 0·027	— 0·027	1·1
H. 7	— 0·041	— 0·041	1·1
H. 8	+ 0·017	+ 0·028	1·1
H. 13	— 0·001	— 0·023	1·1
H. 14	+ 0·002	+ 0·016	1·1
I. 3	— 0·085	— 0·097	1·1
I. 4	+ 0·063	+ 0·071	1·1
J. 1	+ 0·006	— 0·032	1·1
J. 2	+ 0·005	+ 0·050	1·1
J. 5	+ 0·047	+ 0·051	0·9
J. 6	— 0·061	— 0·041	0·9
K. 3	+ 0·025	+ 0·022	1·2
K. 4	— 0·026	— 0·020	1·2
M. 5	+ 0·122	+ 0·183	1·2
M. 6	— 0·105	— 0·169	1·2
N. 5	+ 0·053	+ 0·043	0·9
N. 6	— 0·043	— 0·037	0·9

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Elkin.

	Double Distances—*cont.*		Wt.
	″	″	
N. 11	+ 0·181 or	+ 0·171	1·2
N. 12	— 0·156	— 0·145	1·2
N. 13	+ 0·121	+ 0·116	0·9
N. 14	— 0·102	— 0·095	0·9
N. 19	— 0·050	— 0·060	1·1
N. 20	+ 0·044	+ 0·052	1·1
N. 21	+ 0·009	0·000	0·9
N. 22	— 0·005	+ 0·001	0·9
N. 27	+ 0·219	+ 0·199	1·1
N. 28	— 0·184	— 0·173	1·1
R. 3	+ 0·012	— 0·007	0·6
R. 4	— 0·012	— 0·005	0·6

Finlay.

	Double Distances.		Wt.
	″	″	
C. 1	— 0·196 or	— 0·205	0·5
C. 2	+ 0·154	+ 0·163	0·5
F. 5	+ 0·080	+ 0·072	1·6
F. 6	— 0·078	— 0·064	1·6
H. 11	+ 0·079	+ 0·084	1·6
H. 12	— 0·059	— 0·057	1·6
K. 1	— 0·028	— 0·023	1·1
K. 2	+ 0·026	+ 0·020	1·1
N. 3	— 0·032	— 0·025	1·6
N. 4	+ 0·025	+ 0·028	1·6
N. 17	— 0·080	— 0·078	2·8
N. 18	+ 0·066	+ 0·063	2·8
R. 5	+ 0·005	— 0·001	0·9
R. 6	— 0·001	+ 0·001	0·9
T. 1	+ 0·022	+ 0·018	1·1
T. 2	— 0·012	— 0·006	1·1
T. 7	+ 0·080	+ 0·080	0·9
T. 8	— 0·079	— 0·077	0·9

Gill.

	Double Distances.		Wt.
	″	″	
D. 1	— 0·007 or	— 0·011	2·8
D. 2	+ 0·007	+ 0·005	2·8
H. 5	+ 0·026	+ 0·048	0·7
H. 6	— 0·027	— 0·036	0·7
I. 1	+ 0·084	+ 0·097	1·1
I. 2	— 0·062	— 0·071	1·1
J. 3	— 0·020	— 0·021	2·4
J. 4	+ 0·022	+ 0·046	2·4
M. 3	+ 0·025	+ 0·100	3·0
M. 4	— 0·024	— 0·097	3·0
M. 11	+ 0·044	+ 0·113	1·1
M. 12	— 0·048	— 0·114	1·1
N. 9	— 0·119	— 0·111	0·7
N. 10	+ 0·099	+ 0·093	0·7

Gill.

	Double Distances.—*cont.*		Wt.
	″	″	
N. 25	+ 0·035 or	+ 0·036	2·4
N. 26	— 0·021	— 0·024	2·4
R. 1	— 0·015	— 0·002	1·5
R. 2	+ 0·012	+ 0·007	1·5
T. 3	— 0·019	— 0·006	2·0
T. 4	+ 0·009	+ 0·003	2·0
T. 11	— 0·020	— 0·008	2·4
T. 12	+ 0·031	+ 0·019	2·4

Hall.

	Double Distances.		Wt.
	″	″	
W. 3	— 0·008 or	— 0·009	0·9
W. 4	+ 0·007	+ 0·006	0·9
W. 5	— 0·017	— 0·021	0·9
W. 6	+ 0·014	+ 0·018	0·9
W. 7	+ 0·024	+ 0·023	0·9
W. 8	— 0·022	— 0·025	0·9
W. 9	+ 0·038	+ 0·036	0·9
W. 10	— 0·046	— 0·036	0·9
W. 11	— 0·030	— 0·033	0·9
W. 12	+ 0·061	+ 0·042	0·9
W. 13	— 0·021	— 0·048	0·9
W. 14	+ 0·072	+ 0·059	0·9
W. 15	+ 0·019	+ 0·020	0·9
W. 16	— 0·082	— 0·081	0·9
X. 1	— 0·146	— 0·146	0·9
X. 2	+ 0·046	+ 0·048	0·9
X. 3	+ 0·203	+ 0·201	0·9
X. 4	— 0·077	— 0·072	0·9
X. 5	— 0·035	— 0·031	0·9
X. 6	+ 0·023	+ 0·017	0·9
X. 7	— 0·138	— 0·138	0·9
X. 8	+ 0·080	+ 0·082	0·9
X. 9	+ 0·165	+ 0·165	0·9
X. 10	— 0·130	— 0·132	0·9
X. 11	+ 0·172	+ 0·166	0·3
X. 12	— 0·159	— 0·153	0·3
X. 13	— 0·144	— 0·148	0·6
X. 14	+ 0·185	+ 0·178	0·6
X. 15	— 0·012	— 0·029	0·9
X. 16	+ 0·028	+ 0·036	0·9
X. 17	+ 0·007	+ 0·009	0·9
X. 18	— 0·039	— 0·039	0·9
Z. 1	— 0·149	— 0·147	0·9
Z. 2	+ 0·097	+ 0·097	0·9
Z. 3	+ 0·152	+ 0·147	0·9
Z. 4	— 0·107	— 0·111	0·9
Z. 5	+ 0·024	+ 0·036	0·9
Z. 6	— 0·019	— 0·030	0·9
Z. 7	— 0·047	— 0·040	0·9
Z. 8	+ 0·048	+ 0·042	0·9

Hall.

	Double Distances.—*cont.*		Wt.
	″	″	
Z. 9	— 0·059 or	— 0·058	0·9
Z. 10	+ 0·069	+ 0·061	0·9
Z. 11	+ 0·076	+ 0·069	0·9
Z. 12	— 0·084	— 0·082	0·9

Peter.

	Double Distances.		Wt.
	″	″	
C. 9	+ 0·027 or	+ 0·043	1·2
C. 10	— 0·030	— 0·036	1·2
F. 1	— 0·004	+ 0·049	0·9
F. 3	— 0·006	— 0·035	0·9
H. 1	— 0·021	— 0·020	1·2
H. 2	+ 0·018	+ 0·015	1·2
M. 1	— 0·167	— 0·054	0·9
M. 2	+ 0·140	+ 0·027	0·9
M. 7	— 0·062	— 0·059	1·2
M. 8	+ 0·060	+ 0·056	1·2
M. 9	— 0·035	— 0·007	1·2
M. 10	+ 0·045	+ 0·012	1·2
N. 1	— 0·053	— 0·052	1·1
N. 2	+ 0·041	+ 0·045	1·1
N. 7	+ 0·036	+ 0·037	1·2
N. 8	— 0·032	— 0·033	1·2
N. 15	— 0·032	— 0·013	1·2
N. 16	+ 0·026	+ 0·012	1·2
T. 5	— 0·065	— 0·057	1·2
T. 6	+ 0·048	+ 0·051	1·2
T. 9	+ 0·042	+ 0·020	1·1
T. 10	— 0·063	— 0·034	1·1

Stone.

	Double Distances.		Wt.
	″	″	
H. 9	— 0·225 or	— 0·194	0·6
H. 10	+ 0·115	+ 0·134	0·6
N. 23	— 0·357	— 0·362	0·6
N. 24	+ 0·313	+ 0·305	0·6

Elkin.

	Double Position-Angles.		Wt.
	″	″	
F. 8	+ 0·119 or	+ 0·107	0·9
F. 10	— 0·095	— 0·074	0·9
F. 12	— 0·064	— 0·053	0·8
F. 14	+ 0·050	+ 0·026	0·8

Peter.

	Double Position-Angles.		Wt.
	″	″	
F. 2	— 0·060 or	— 0·108	0·9
F. 4	+ 0·042	+ 0·077	0·9

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From these residuals and weights the following results have been deduced. In the first place, collecting all the values for $p\,vv$ for the different groups, and denoting by m the number of equations and by n the number of unknowns determined in each group, we get, according as we disregard or include the personal error terms :

"Single Star" Groups.				
Group.	$\Sigma\,(p\,vv)$		m	n
A	0·287 or	0·187	7	4
E	0·191	0·224	9	4
G	0·052	0·052	5	4
L	0·001	0·004	5	4
Q	0·700	1·092	24	6
S	0·436	0·617	25	6
U	0·634	0·447	18	6
Sum :	2·301 or	2·623	93	35*
Prob. Error for Wt. 1	± 0″·135 or ± 0″·144.			

* Including a unit added for π.

"Opposite Star" Groups.				
Group.	$\Sigma\,(p\,vv)$		m	n
C	0·081 or	0·081	12	9
D	0·001	0·001	4	3
F	0·098	0·151	14	11
H	0·060	0·059	14	10
I	0·025	0·032	4	3
J	0·007	0·014	6	5
K	0·003	0·002	4	3
M	0·094	0·093	12	9
N	0·388	0·359	28	17
R	0·001	0·000	6	5
T	0·031	0·021	12	9
W	0·020	0·020	14	10
X	0·179	0·178	18	12
Z	0·085	0·080	12	9
Sum :	1·073 or	1·091	160	116*
Prob. Error for Wt. 1	± 0″·106 or ± 0″·107.			

Secondly, separating out the residuals for each observer, and denoting by n' a number proportionate to m, and taken so to make the sum $\Sigma\,(m-n')$ equal to $\Sigma\,(m-n)$ we find for the different classes of measures, and for the two cases of the personal error terms :

	Single Distances.						Double Distances.					
Observer.	$\Sigma\,(p\,vv)$		m	n'	Prob. Error for Wt. 1.		$\Sigma\,(p\,vv)$		m	n'	Prob. Error for Wt. 1.	
Elkin	0·357 or	0·468	13	4·9	± 0″·142 or	± 0″·162	0·337 or	0·363	44	31·9	± 0″·113 or	± 0″·117
Finlay ...	0·157	0·160	8	3·0	0·120	0·121	0·116	0·108	18	13·1	0·103	0·114
Gill	0·132	0·181	9	3·4	0·103	0·121	0·048	0·055	22	15·9	0·060	0·064
Hall	0·121	0·228	9	3·4	0·099	0·136	0·286	0·278	44	31·9	0·104	0·102
Peter.....	0·291	0·250	9	3·4	0·154	0·143	0·081	0·083	22	15·9	0·078	0·079
Stone.....	0·001	0·136	1	0·4	...	...	0·174	0·168	4	2·9	...	...
Sum :	1·059 or	1·423	49	18·5	± 0″·126 or	± 0″·146	1·042 or	1·055	154	111·6	± 0″·106 or	± 0″·109

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	Single Position-Angles.				Double Position-Angles.			
Observer.	$\Sigma(p\,vv)$	m	n'	Prob. Error for Wt. 1.	$\Sigma(p\,vv)$	m	n'	Prob. Error for Wt. 1.
Elkin	0·601 or 0·540	13	4·9	± 0″·184 or ± 0″·174	0·026 or 0·020	4	2·9	... or ...
Finlay ...	0·089 0·071	6	2·2	0·103 0·092	...	...	...	... ...
Gill	0·190 0·069	6	2·2	0·151 0·091	...	...	...	... ...
Hall	0·171 0·305	9	3·4	0·118 0·158	...	...	...	... ...
Peter	0·184 0·213	9	3·4	0·122 0·132	0·005 0·016	2·	1·5	... ...
Stone.....	0·007 0·002	1	0·4	... ...	...	...	...	... ...
Sum :	1·242 or 1·200	44	16·5	± 0″·143 or ± 0″·141	0·031 or 0·036	6	4·4	± 0″·094 or ± 0″·101
Distances and Angles.	2·301 or 2·623	93	35	± 0″·135 or ± 0″·144	1·073 or 1·091	160	116	± 0″·106 or ± 0″·107

The examination of these results shows that for the "opposite star" groups the introduction of the personal errors, according to the assumed law, has had little or no effect, and also that the original estimate for the probable error for weight unity, ± 0″·100, is fairly borne out. The values for the "single star" groups, on the other hand, seem to show that nothing whatever has been gained by using these personal errors with the assumed law, while at the same time the deviation of the probable error for weight unity indicates that considerable systematic error yet remains uneliminated. It is, therefore, doubtful whether these results from the "single star" groups should be entitled to any weight at all, but after consideration it seems admissible to at least consider the solution which includes them with the diminished weight already explained.

As regards the values for the probable error for weight unity for the different observers, it would appear that the Cape and Leipzig measures have been considerably under-weighted—especially the "double distances" for Gill—and the Yale ones over-weighted. The process by which these results for the various observers have been obtained is, however, by no means a very rigid or satisfactory one—it is equivalent to that adopted by Dr. Gill for the Victoria series—so that for the present I have not thought it worth while to undertake a new solution with modified weights, having satisfied myself that no material change in the final deductions would be likely to ensue.

I therefore adopt as the outcome of this discussion "in groups," the values $\pi = +0''\cdot015$ or $+0''\cdot014$, or corrections to the assumed mean solar parallax 8″·800 of $+0''\cdot013$ and $+0''\cdot012$, and applying further the correction for the distance of the planet, $-0''\cdot003$, we arrive at the values :

$$8''\cdot810 \text{ or } 8''\cdot809$$

of which the probable error would be $\pm 0''\cdot100 \times 0\cdot88 : \sqrt{73\cdot107}$ or $\pm 0''\cdot0103$ if the probable error for weight unity be taken as originally estimated.

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The several groups lead, however, to the following values, accordingly as we exclude or introduce the personal error terms :

Group.	Without Personal Errors.	With Personal Errors.	Weight.	Group.	Without Personal Errors.	With Personal Errors.	Weight.
A	8″·571	8″·606	0·434	H	8″·869	8″·874	5·890
E	8·772	8·920	0·597	I	8·897	8·903	2·852
G	8·619	8·624	0·391	J	8·776	8·774	3·703
L	8·844	8·810	0·371	K	8·789	8·789	3·375
Q	8·826	8·831	2·037	M	8·853	8·853	10·038
S	8·863	8·735	2·570	N	8·777	8·777	18·048
U	8·535	8·660	0·691	R	8·803	8·806	1·498
				T	8·815	8·826	5·487
C	9·071	9·048	0·621	W	8·797	8·795	2·586
D	8·827	8·824	4·451	X	8·784	8·785	3·501
F	8·904	8·890	1·147	Z	8·718	8·718	2·819

and if we form the value $\Sigma\, p\, vv$ for the residuals of these groups from the final results 8″·810 or 8″·809, we find for it 0·268 or 0·234 without and with the personal error terms respectively. These values give the probable error for weight unity (which should here come out equal to ±0″·088) ±0″·078 or ±0″·073, and hence the probable error of the mean ±0″·0091 or ±0″·0085 in the two cases. This is considerably smaller than the value deduced from the residuals of the measures, and the diminution is probably due, as pointed out by Dr. Gill, to the partial elimination of the casual error of the ephemeris.

11.—Solution of Equations of Condition in Simultaneous Combinations.

As set forth in the introductory section, only a fraction of the measures of Iris secured were strictly simultaneous at two stations. The Leipzig observations were made about six hours previous to, and the Yale morning series about six hours later than, the Cape and Yale principal series. The "combinations" indicated in the table in that section (pp. 6–9), cover therefore often half a day, and in a number of instances—nine in all—observations on two successive days have been taken together. An examination of the equations of condition for these latter cases will show, however, that in every case a parallax co-efficient of a certain sign is enclosed between two others of opposite sign—five of the cases being in the Yale diurnal series—so that the effect of the ephemeris variations on the parallax will not be greater than in the shorter "combinations." I have carried along the terms α', δ' and κ' as designated in the foregoing section, so that their numerical effect can be ultimately considered.

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For the "combinations" from the "single star" groups no especial treatment has been required; for those from the "opposite star" groups I have formed equations from the *sums* and *differences* of the two distances measured, in the manner usually adopted in stellar parallax discussions, and as will be shown specifically in the first combination thus treated—XVII., on page 156.

Combinations from "Single Star" Groups.

Combination I.—October 10–11.

The reduced equations of condition of Group A, viz.: A 1, A 2, A 3, A 4, A 5 and A 6, furnish the following normals:

$$\begin{array}{rrrrrrrr}
+1{\cdot}694\,\pi & +0{\cdot}513\,\alpha & -1{\cdot}230\,\delta = & +0''{\cdot}135 & +0{\cdot}97\,\text{E.} & -0{\cdot}415\,\alpha' & -1{\cdot}204\,\delta' \\
+0{\cdot}513 & +2{\cdot}247 & 0{\cdot}000 & -0{\cdot}804 & +2{\cdot}15 & -2{\cdot}182 & 0{\cdot}000 \\
-1{\cdot}230 & 0{\cdot}000 & +2{\cdot}700 & -0{\cdot}796 & -1{\cdot}01 & 0{\cdot}000 & -2{\cdot}623
\end{array}$$

which give after elimination of α and δ:

$$+1{\cdot}017\,\pi = -0''{\cdot}043 \quad +0{\cdot}01\,\text{E.} \quad +0{\cdot}084\,\alpha' \quad -0{\cdot}009\,\delta'.$$

Combination II.—October 24.

The equations E 2, E 3, E 4, E 5, E 6, E 7, E 8, E 9 lead to the normals:

$$\begin{array}{rrrrrrrrr}
+2{\cdot}767\,\pi & +0{\cdot}063\,\alpha & -1{\cdot}244\,\delta = & -0''{\cdot}069 & +1{\cdot}40\,\text{E.} & -0{\cdot}38\,\text{G.} & +1{\cdot}22\,\text{P.} & +0{\cdot}423\,\alpha' & -0{\cdot}502\,\delta' \\
+0{\cdot}063 & +3{\cdot}164 & -0{\cdot}081 & -0{\cdot}460 & -2{\cdot}02 & -0{\cdot}42 & -0{\cdot}74 & +1{\cdot}284 & -0{\cdot}032 \\
-1{\cdot}244 & -0{\cdot}081 & +3{\cdot}665 & -0{\cdot}109 & -2{\cdot}99 & -0{\cdot}68 & -2{\cdot}61 & -0{\cdot}034 & +1{\cdot}479
\end{array}$$

giving:

$$+2{\cdot}345\,\pi = -0''{\cdot}101 \quad +0{\cdot}41\,\text{E.} \quad -0{\cdot}61\,\text{G.} \quad +0{\cdot}34\,\text{P.} \quad +0{\cdot}397\,\alpha' \quad -0{\cdot}001\,\delta'.$$

Combination III.—October 26.

From the equations G 1, G 2, G 3, G 4 we get the normals:

$$\begin{array}{rrrrrrrr}
+1{\cdot}880\,\pi & +0{\cdot}309\,\alpha & +0{\cdot}601\,\delta = & -0''{\cdot}363 & +1{\cdot}24\,\text{G.} & -0{\cdot}31\,\text{P.} & -0{\cdot}293\,\alpha' & -1{\cdot}072\,\delta' \\
+0{\cdot}309 & +1{\cdot}503 & +0{\cdot}204 & -0{\cdot}119 & +0{\cdot}45 & +0{\cdot}32 & -2{\cdot}072 & -0{\cdot}306 \\
+0{\cdot}601 & +0{\cdot}204 & +2{\cdot}433 & -0{\cdot}786 & +1{\cdot}73 & +0{\cdot}78 & -0{\cdot}323 & -3{\cdot}468
\end{array}$$

whence:

$$+1{\cdot}687\,\pi = -0''{\cdot}160 \quad +0{\cdot}76\,\text{G.} \quad -0{\cdot}54\,\text{P.} \quad +0{\cdot}153\,\alpha' \quad -0{\cdot}212\,\delta'.$$

Combination IV.—November 5.

Taking the equations L 2, L 3, L 4, we find the normals:

$$\begin{array}{rrrrrrrr}
+3{\cdot}653\,\pi & -1{\cdot}706\,\alpha & +1{\cdot}750\,\delta = & +1''{\cdot}570 & -4{\cdot}19\,\text{G.} & +1{\cdot}01\,\text{P.} & +0{\cdot}141\,\alpha' & -0{\cdot}159\,\delta' \\
-1{\cdot}706 & +2{\cdot}511 & -1{\cdot}813 & -1{\cdot}945 & +3{\cdot}24 & -0{\cdot}93 & +0{\cdot}223 & -0{\cdot}007 \\
+1{\cdot}750 & -1{\cdot}813 & +2{\cdot}808 & +1{\cdot}114 & -3{\cdot}41 & -0{\cdot}56 & -0{\cdot}008 & +0{\cdot}248
\end{array}$$

and

$$+2{\cdot}315\,\pi = +0''{\cdot}348 \quad -1{\cdot}61\,\text{G.} \quad +0{\cdot}80\,\text{P.} \quad +0{\cdot}240\,\alpha' \quad -0{\cdot}247\,\delta'.$$

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Combination V.—November 18.

From the equations Q 1, Q 2, Q 3, Q 4 we derive the normals:

$$\begin{array}{rrrrrrrr}
+1{\cdot}219\,\pi & +0{\cdot}734\,\alpha & +0{\cdot}118\,\delta & = -0''{\cdot}104 & +0{\cdot}66\,\mathrm{F.} & -0{\cdot}28\,\mathrm{P.} & +1{\cdot}645\,\alpha' & +0{\cdot}120\,\delta' \\
+0{\cdot}734 & +0{\cdot}913 & +0{\cdot}329 & -0{\cdot}186 & +0{\cdot}30 & +0{\cdot}25 & +2{\cdot}082 & +0{\cdot}689 \\
+0{\cdot}118 & +0{\cdot}329 & +1{\cdot}875 & +0{\cdot}231 & +0{\cdot}90 & +0{\cdot}66 & +0{\cdot}691 & +4{\cdot}118
\end{array}$$

and

$$+0{\cdot}617\,\pi = +0''{\cdot}070 \quad +0{\cdot}48\,\mathrm{F.} \quad -0{\cdot}43\,\mathrm{P.} \quad -0{\cdot}022\,\alpha' \quad -0{\cdot}039\,\delta'.$$

Combination VI.—November 20.

Taking the equations Q 7, Q 8, Q 9, Q 10, Q 11, Q 12, Q 13, Q 14, we get the normals:

$$\begin{array}{rrrrrrrrr}
+2{\cdot}794\,\pi & -0{\cdot}493\,\alpha & -0{\cdot}128\,\delta & = -0''{\cdot}135 & -0{\cdot}76\,\mathrm{E.} & +2{\cdot}93\,\mathrm{F.} & -0{\cdot}68\,\mathrm{S.} & +0{\cdot}128\,\alpha' & +0{\cdot}150\,\delta' \\
-0{\cdot}493 & +4{\cdot}114 & +0{\cdot}121 & -0{\cdot}013 & -4{\cdot}78 & -5{\cdot}25 & -1{\cdot}65 & -0{\cdot}072 & +0{\cdot}008 \\
-0{\cdot}128 & +0{\cdot}121 & +4{\cdot}062 & +0{\cdot}853 & -0{\cdot}53 & +0{\cdot}20 & +0{\cdot}14 & +0{\cdot}021 & +0{\cdot}001
\end{array}$$

which lead to:

$$+2{\cdot}732\,\pi = -0''{\cdot}113 \quad -1{\cdot}35\,\mathrm{E.} \quad +2{\cdot}31\,\mathrm{F.} \quad -0{\cdot}88\,\mathrm{S.} \quad +0{\cdot}040\,\alpha' \quad +0{\cdot}151\,\delta'.$$

Combinaton VII.—November 21.

From the equations Q 15, Q 16, Q 17, Q 18 we find the normals:

$$\begin{array}{rrrrrrrr}
+0{\cdot}521\,\pi & -0{\cdot}333\,\alpha & -0{\cdot}300\,\delta & = +0''{\cdot}132 & +0{\cdot}42\,\mathrm{E.} & +0{\cdot}464\,\alpha' & +0{\cdot}400\,\delta' \\
-0{\cdot}333 & +1{\cdot}610 & 0{\cdot}000 & -0{\cdot}581 & -1{\cdot}47 & -1{\cdot}776 & 0{\cdot}000 \\
-0{\cdot}300 & 0{\cdot}000 & +1{\cdot}800 & +0{\cdot}698 & -1{\cdot}25 & 0{\cdot}000 & -0{\cdot}173
\end{array}$$

furnishing:

$$+0{\cdot}403\,\pi = +0''{\cdot}128 \quad -0{\cdot}09\,\mathrm{E.} \quad +0{\cdot}096\,\alpha' \quad +0{\cdot}371\,\delta'.$$

Combination VIII.—November 22.

The equations Q 19, Q 20, Q 21, Q 22, Q 23, Q 24 give the normals:

$$\begin{array}{rrrrrrrrr}
+1{\cdot}319\,\pi & -0{\cdot}182\,\alpha & -1{\cdot}171\,\delta & = -0''{\cdot}243 & +0{\cdot}35\,\mathrm{E.} & +0{\cdot}34\,\mathrm{F.} & +0{\cdot}448\,\alpha' & +2{\cdot}360\,\delta' \\
-0{\cdot}182 & +2{\cdot}694 & +0{\cdot}568 & -0{\cdot}814 & -0{\cdot}89 & -0{\cdot}84 & -5{\cdot}374 & -0{\cdot}984 \\
-1{\cdot}171 & +0{\cdot}568 & +2{\cdot}993 & +0{\cdot}961 & -1{\cdot}01 & -0{\cdot}88 & -0{\cdot}987 & -5{\cdot}972
\end{array}$$

and

$$+0{\cdot}859\,\pi = +0''{\cdot}148 \quad -0{\cdot}04\,\mathrm{E.} \quad +0{\cdot}01\,\mathrm{F.} \quad +0{\cdot}141\,\alpha' \quad +0{\cdot}018\,\delta'.$$

Combination IX.—November 28–29.

With the equations S 1, S 2, S 3, S 4, S 5 we derive the normals:

$$\begin{array}{rrrrrrrrr}
+2{\cdot}010\,\pi & -0{\cdot}658\,\alpha & +0{\cdot}772\,\delta & = +0''{\cdot}417 & +0{\cdot}92\,\mathrm{G.} & -0{\cdot}35\,\mathrm{P.} & -1{\cdot}672\,\alpha' & +1{\cdot}288\,\delta' \\
-0{\cdot}658 & +3{\cdot}133 & -0{\cdot}182 & +0{\cdot}094 & +0{\cdot}28 & +0{\cdot}15 & +6{\cdot}320 & -0{\cdot}532 \\
+0{\cdot}772 & -0{\cdot}182 & +2{\cdot}537 & +2{\cdot}167 & +1{\cdot}36 & +0{\cdot}71 & -0{\cdot}533 & +4{\cdot}316
\end{array}$$

giving:

$$+1{\cdot}658\,\pi = -0''{\cdot}194 \quad +0{\cdot}58\,\mathrm{G.} \quad -0{\cdot}53\,\mathrm{P.} \quad -0{\cdot}294\,\alpha' \quad -0{\cdot}068\,\delta'.$$

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Combination X.—November 30.

Using the equations S 6, S 7, S 8, the normals are found :

+ 1·148 π	+ 0·664 α	+ 0·722 δ	= + 0″·503	+ 1·50 F.	− 0·36 H.	+ 0·384 α'	+ 0·528 δ'
+ 0·664	+ 0·914	+ 0·380	+ 0·080	+ 0·52	+ 0·35	+ 0·490	+ 0·251
+ 0·722	+ 0·380	+ 2·392	+ 1·692	+ 2·03	+ 1·25	+ 0·250	+ 1·456

and thence :

$$+ 0{\cdot}577\,\pi = + 0''{\cdot}108 \quad + 0{\cdot}76\,\text{F.} \quad - 0{\cdot}84\,\text{H.} \quad + 0{\cdot}020\,\alpha' \quad + 0{\cdot}075\,\delta'.$$

Combination XI.—December 1.

The equations S 9, S 10, S 11, S 12 furnish the normals :

+ 0·991 π	− 0·064 α	− 0·839 δ	= − 0″·362	− 3·39 H.	+ 0·190 α'	+ 0·514 δ'
− 0·064	+ 1·633	0·000	− 0·764	+ 4·38	− 0·988	+ 0·002
− 0·839	0·000	+ 1·800	+ 0·976	+ 4·95	0·000	− 1·092

and

$$+ 0{\cdot}596\,\pi = + 0''{\cdot}063 \quad - 0{\cdot}91\,\text{H.} \quad + 0{\cdot}165\,\alpha' \quad + 0{\cdot}005\,\delta'.$$

Combination XII.—December 2.

With the equations S 13, S 14, S 15, S 16, S 17, S 18 we get the normals :

+2·370 π	−0·943 α	+0·571 δ =	+1″·051	−6·61 F.	+2·56 H.	+1·516 α'	−0·615 δ'
−0·943	+3·255	−0·288	−2·042	+8·09	+5·10	−4·923	+0·462
+0·571	−0·288	+3·389	+2·829	−4·33	−4·12	+0·435	−5·106

and the final equation :

$$+2{\cdot}026\,\pi = +0''{\cdot}076 \quad -3{\cdot}74\,\text{F.} \quad +4{\cdot}57\,\text{H.} \quad +0{\cdot}087\,\alpha' \quad +0{\cdot}253\,\delta'.$$

Combination XIII.—December 3–4.

The equations S 19, S 20, S 21, S 22, S 23 give the normals :

+1·513 π	+0·527 α	−0·251 δ =	−0″·202	−1·61 G.	+0·61 H.	+1·43 P.	−1·674 α'	+0·918 δ'
+0·527	+1·826	−0·387	−1·257	+0·92	+0·34	+0·94	−5·068	+0·934
−0·251	−0·387	+2·589	+1·526	−1·88	−0·92	−1·69	+0·933	−7·070

whence :

$$+1{\cdot}353\,\pi = +0''{\cdot}232 \quad -1{\cdot}97\,\text{G.} \quad +0{\cdot}46\,\text{H.} \quad +1{\cdot}08\,\text{P.} \quad -0{\cdot}216\,\alpha' \quad +0{\cdot}267\,\delta'.$$

Combination XIV.—December 6.

The normals from the equations U 3, U 4, U 5, U 6 are :

+0·888 π	+1·019 α	−0·154 δ =	−0″·121	−0·45 E.	+1·128 α'	−0·195 δ'
+1·019	+1·644	0·000	−0·005	−0·60	+1·821	0·000
−0·154	0·000	+1·803	−0·053	+1·03	0·000	+1·994

giving :

$$+0{\cdot}245\,\pi = -0''{\cdot}123 \quad +0{\cdot}01\,\text{E.} \quad -0{\cdot}001\,\alpha' \quad -0{\cdot}025\,\delta'.$$

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Combination XV.—December 8.

From the equations U 7, U 8, U 9 we find the normals :

$+1{\cdot}348\,\pi$	$-0{\cdot}158\,\alpha$	$+0{\cdot}488\,\delta =$	$-0''{\cdot}208$	$+1{\cdot}39$ F.	$-0{\cdot}72$ P.	$-0{\cdot}078\,\alpha$	$+0{\cdot}292\,\delta'$
$-0{\cdot}158$	$+1{\cdot}199$	$-0{\cdot}669$	$+0{\cdot}187$	$-0{\cdot}92$	$-0{\cdot}48$	$+0{\cdot}825$	$+0{\cdot}669$
$+0{\cdot}488$	$-0{\cdot}669$	$+2{\cdot}085$	$+0{\cdot}740$	$+1{\cdot}64$	$+0{\cdot}84$	$-0{\cdot}433$	$+1{\cdot}410$

and hence :

$$+1{\cdot}234\,\pi = -0''{\cdot}381 \quad +1{\cdot}00\ \text{F.} \quad -0{\cdot}92\ \text{P.} \quad +0{\cdot}024\,\alpha' \quad -0{\cdot}037\,\delta'.$$

Combination XVI.—December 12–13.

Taking together the equations U 15, U 16, U 17, U 18, U 19, U 20, U 21, U 22, the normals are derived :

$+1{\cdot}320\,\pi$	$+0{\cdot}794\,\alpha$	$-1{\cdot}468\,\delta =$	$+0''{\cdot}275$	$+0{\cdot}79$ H.	$+0{\cdot}53$ P.	$-0{\cdot}436\,\alpha'$	$+0{\cdot}729\,\delta'$
$+0{\cdot}794$	$+3{\cdot}029$	$0{\cdot}000$	$+1{\cdot}182$	$+2{\cdot}03$	$+0{\cdot}65$	$-1{\cdot}485$	$0{\cdot}000$
$-1{\cdot}468$	$0{\cdot}000$	$+3{\cdot}302$	$+0{\cdot}418$	$-1{\cdot}12$	$-0{\cdot}37$	$0{\cdot}000$	$-1{\cdot}620$

leading to the final equation :

$$+0{\cdot}458\,\pi = +0''{\cdot}151 \quad -0{\cdot}23\ \text{H.} \quad +0{\cdot}17\ \text{P.} \quad -0{\cdot}047\,\alpha' \quad -0{\cdot}000\,\delta'.$$

Combinations from "Opposite Star" Groups.

Combination XVII.—October 15.

The original equations from which the two equations C 1 and C 2 were derived by the introduction of the factor $\cos\,(p - p_0)$ and the unknowns κ, κ', κ'', were as follows :

October 15·56	$+\,0{\cdot}437\,s_1$	$+\,0{\cdot}872\,\pi$	$-\,0{\cdot}223\,\alpha$	$+\,0{\cdot}970\,\delta$	$= -\,0''{\cdot}435$	$+\,0{\cdot}229$ F.
Cape.	$+\,0{\cdot}539$	$-\,0{\cdot}874$	$+\,0{\cdot}684$	$-\,0{\cdot}664$	$+\,0{\cdot}280$	$+\,0{\cdot}186$

If we form the sum and difference of these two equations we get :

Sum	$+\,0{\cdot}976\,s_1$	$-\,0{\cdot}002\,\pi$	$+\,0{\cdot}461\,\alpha$	$+\,0{\cdot}306\,\delta$	$= -\,0''{\cdot}155$	$+\,0{\cdot}415$ F.
Difference	$-\,0{\cdot}102$	$+\,1{\cdot}746$	$-\,0{\cdot}907$	$+\,1{\cdot}634$	$-\,0{\cdot}715$	$+\,0{\cdot}044$

Multiplying the "sum" equation by the factor (0·102) : (0·976), and adding the result to the "difference" equation, we get an expression from which the scale-value is eliminated, as follows :—

$$+\,1{\cdot}746\,\pi \quad (-\,0{\cdot}859\,\alpha \quad +\,1{\cdot}666\,\delta) = -\,0''{\cdot}731 \quad +\,0{\cdot}087\ \text{F.}$$

Similarly, from the equations C 3 and C 4 we find an equation :

$$-\,0{\cdot}603\,\pi \quad (-\,0{\cdot}868\,\alpha \quad +\,1{\cdot}671\,\delta) = -\,1''{\cdot}364 \quad +\,0{\cdot}090\ \text{E.}$$

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If we now assume the equality of the expressions enclosed in parentheses and put them both = to κ, introduce a term κ' showing the effect of a variation of κ with the time on the right-hand side of the equations, and give each equation its approximate weight, which is clearly one half of those previously used, we get the normals :

$$\begin{array}{lllllll} +0{\cdot}924\,\pi & +0{\cdot}164\,\kappa & = +0''{\cdot}052 & -0{\cdot}024\,\text{E.} & +0{\cdot}039\,\text{F.} & +0{\cdot}071\,\kappa' \\ +0{\cdot}164 & +0{\cdot}700 & -0{\cdot}797 & +0{\cdot}040 & +0{\cdot}022 & -0{\cdot}117 \end{array}$$

which give by elimination of κ a final equation for π, viz. :

$$+0{\cdot}886\,\pi = +0''{\cdot}238 \quad -0{\cdot}033\,\text{E.} \; +0{\cdot}034\,\text{F.} \; +0{\cdot}098\,\kappa'.$$

Combination XVIII.—October 21.

A similar treatment to that just described of the equations which gave those for D 1, D 2 and D 3, D 4 furnishes two others :

$$\begin{array}{lllll} +1{\cdot}704\,\pi & (-1{\cdot}225\,\alpha & -1{\cdot}487\,\delta) = -0''{\cdot}637 & +0{\cdot}013\,\text{F.} & +0{\cdot}027\,\text{G.} \\ -1{\cdot}577 & (-1{\cdot}227 & -1{\cdot}475\;) \quad -0{\cdot}748 & +0{\cdot}040\,\text{E.} & \end{array}$$

which lead to the normals :

$$\begin{array}{lllllll} +5{\cdot}551\,\pi & +1{\cdot}436\,\kappa & = -0''{\cdot}811 & -0{\cdot}038\,\text{E.} & +0{\cdot}032\,\text{F.} & +0{\cdot}063\,\text{G.} & +0{\cdot}024\,\kappa' \\ +1{\cdot}436 & +2{\cdot}000 & -1{\cdot}341 & +0{\cdot}024 & +0{\cdot}019 & +0{\cdot}037 & +0{\cdot}014 \end{array}$$

and the final equation for π :

$$+4{\cdot}520\,\pi = +0''{\cdot}151 \; -0{\cdot}055\,\text{E.} \; +0{\cdot}018\,\text{F.} \; +0{\cdot}037\,\text{G.} \; +0{\cdot}014\,\kappa'.$$

Combination XIX.—October 24.

The equations of Group F give, if we transfer the terms in α' and δ' to the right-hand side of the equations, the following equation for π :

$$+2{\cdot}616\,\pi = +0''{\cdot}097 \quad -0{\cdot}118\,\text{E.} \; +0{\cdot}246\,\text{F.} \; -0{\cdot}219\,\text{P.} \; +0{\cdot}595\,\alpha' \; -0{\cdot}045\,\delta'.$$

Combination XX.—October 29.

Treating the equations H 5, H 6 and H 7, H 8 in the manner described, we get :

$$\begin{array}{lllll} -1{\cdot}573\,\pi & (+1{\cdot}354\,\alpha & -1{\cdot}354\,\delta) = +0''{\cdot}091 & +0{\cdot}150\,\text{G.} \\ +1{\cdot}630 & (+1{\cdot}349 & -1{\cdot}360\;) \quad +0{\cdot}269 & +0{\cdot}148\,\text{E.} \end{array}$$

and the normals :

$$\begin{array}{lllllll} +2{\cdot}453\,\pi & +0{\cdot}267\,\kappa & = +0''{\cdot}184 & -0{\cdot}094\,\text{G.} & +0{\cdot}133\,\text{E.} & -0{\cdot}025\,\kappa' \\ +0{\cdot}267 & +0{\cdot}950 & +0{\cdot}184 & +0{\cdot}060 & +0{\cdot}081 & -0{\cdot}027 \end{array}$$

and the final equation :

$$+2{\cdot}378\,\pi = +0''{\cdot}132 \quad +0{\cdot}110\,\text{E.} \; -0{\cdot}111\,\text{G.} \; -0{\cdot}020\,\kappa'.$$

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Combination XXI.—October 30.

From the equations H 9, H 10, H 11, H 12 and H 13, H 14 we derive :

$$\begin{array}{llll} +0{\cdot}928\,\pi & (+1{\cdot}320\,\alpha & -1{\cdot}386\,\delta) = +0''{\cdot}547 & +0{\cdot}174\,\text{S.} \\ -1{\cdot}699 & (+1{\cdot}319 & -1{\cdot}387\ ) & -0{\cdot}005 \quad +0{\cdot}178\,\text{F.} \\ +1{\cdot}573 & (+1{\cdot}319 & -1{\cdot}390\ ) & +0{\cdot}199 \quad +0{\cdot}174\,\text{E.} \end{array}$$

whence the normals :

$$\begin{array}{lllllll} +3{\cdot}782\,\pi & -0{\cdot}129\,\kappa = +0''{\cdot}330 & +0{\cdot}150\,\text{E.} & -0{\cdot}227\,\text{F.} & +0{\cdot}048\,\text{S.} & -0{\cdot}014\,\kappa' \\ -0{\cdot}129 & +1{\cdot}600 & +0{\cdot}269 & +0{\cdot}098 & +0{\cdot}133 & +0{\cdot}052 & -0{\cdot}005 \end{array}$$

and the equation for π :

$$+3{\cdot}772\,\pi = +0''{\cdot}352 \quad +0{\cdot}158\,\text{E.} \quad -0{\cdot}216\,\text{F.} \quad +0{\cdot}052\,\text{S.} \quad -0{\cdot}015\,\kappa'.$$

Combination XXII.—October 31.

The equations I 1, I 2 and I 3. I 4 lead to the following two :

$$\begin{array}{llll} -1{\cdot}598\,\pi & (+1{\cdot}542\,\alpha & -1{\cdot}106\,\delta) = -0''{\cdot}106 & +0{\cdot}124\,\text{G.} \\ +1{\cdot}661 & (+1{\cdot}541 & -1{\cdot}108\ ) & +0{\cdot}262 \quad +0{\cdot}121\,\text{E.} \end{array}$$

giving the normals :

$$\begin{array}{lllllll} +2{\cdot}921\,\pi & +0{\cdot}037\,\kappa = +0''{\cdot}332 & +0{\cdot}110\,\text{E.} & -0{\cdot}109\,\text{G.} & -0{\cdot}009\,\kappa' \\ +0{\cdot}037 & +1{\cdot}100 & +0{\cdot}086 & +0{\cdot}066 & +0{\cdot}068 & -0{\cdot}006 \end{array}$$

and

$$+2{\cdot}920\,\pi = +0''{\cdot}329 \quad +0{\cdot}108\,\text{E.} \quad -0{\cdot}111\,\text{G.} \quad -0{\cdot}009\,\kappa'.$$

Combination XXIII.—November 2.

With the equations J 3, J 4 and J 5, J 6 we derive :

$$\begin{array}{llll} -1{\cdot}820\,\pi & (+1{\cdot}015\,\alpha & -1{\cdot}674\,\delta) = +0''{\cdot}030 & -0{\cdot}125\,\text{G.} \\ +1{\cdot}558 & (+1{\cdot}016 & -1{\cdot}675\ ) & -0{\cdot}052 \quad -0{\cdot}132\,\text{E.} \end{array}$$

furnishing the normals :

$$\begin{array}{lllllll} +5{\cdot}065\,\pi & -1{\cdot}483\,\kappa = -0''{\cdot}101 & -0{\cdot}093\,\text{E.} & +0{\cdot}295\,\text{G.} & +0{\cdot}000\,\kappa' \\ -1{\cdot}483 & +1{\cdot}650 & +0{\cdot}013 & -0{\cdot}059 & -0{\cdot}150 & 0{\cdot}000 \end{array}$$

and

$$+3{\cdot}732\,\pi = -0''{\cdot}089 \quad -0{\cdot}146\,\text{E.} \quad +0{\cdot}160\,\text{G.} \quad +0{\cdot}000\,\kappa'.$$

Combination XXIV.—November 3.

Taking the equations K 1, K 2 and K 3, K 4, we find :

$$\begin{array}{llll} -1{\cdot}772\,\pi & (+1{\cdot}397\,\alpha & -1{\cdot}321\,\delta) = -0''{\cdot}011 & -0{\cdot}008\,\text{F.} \\ +1{\cdot}657 & (+1{\cdot}397 & -1{\cdot}319\ ) = -0{\cdot}047 & -0{\cdot}016\,\text{E.} \end{array}$$

which lead to the normals :

$$\begin{array}{lllllll} +3{\cdot}371\,\pi & +0{\cdot}019\,\kappa = -0{\cdot}036 & -0{\cdot}016\,\text{E.} & +0{\cdot}008\,\text{F.} & +0{\cdot}000\,\kappa \\ +0{\cdot}019 & +1{\cdot}150 & -0{\cdot}034 & -0{\cdot}010 & -0{\cdot}004 & 0{\cdot}000 \end{array}$$

and

$$+3{\cdot}371\,\pi = -0''{\cdot}035 \quad -0{\cdot}016\,\text{E.} \quad +0{\cdot}008\,\text{F.} \quad +0{\cdot}000\,\kappa'.$$

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Combination XXV.—November 7–8.

Using the equations M 1, M 2, M 3, M 4, M 5, M 6, M 7, M 8, there results:

$$\begin{array}{llll} +1\cdot644\,\pi & (+0\cdot555\,\alpha & -1\cdot838\,\delta) = +0''\cdot812 & +0\cdot062\,\text{P.} \\ -1\cdot733 & (+0\cdot538 & -1\cdot865\ ) & +0\cdot402 \quad +0\cdot052\,\text{G.} \\ +1\cdot292 & (+0\cdot534 & -1\cdot866\ ) & +0\cdot280 \quad +0\cdot047\,\text{E.} \\ +1\cdot617 & (+0\cdot501 & -1\cdot911\ ) & +0\cdot668 \quad +0\cdot010\,\text{P.} \end{array}$$

and the normals:

$$\begin{array}{lllllll} +8\cdot292\,\pi & -0\cdot112\,\kappa & = +0''\cdot422 & +0\cdot037\,\text{E.} & -0\cdot135\,\text{G.} & +0\cdot055\,\text{P.} & +0\cdot207\,\kappa' \\ -0\cdot112 & +3\cdot150 & +1\cdot538 & +0\cdot029 & +0\cdot078 & +0\cdot034 & +0\cdot126 \end{array}$$

giving

$$+8\cdot288\,\pi = +0''\cdot477 \quad +0\cdot038\,\text{E.} \quad -0\cdot132\,\text{G.} \quad +0\cdot054\,\text{P.} \quad +0\cdot211\,\kappa'.$$

Combination XXVI.—November 9.

From the equations M 9, M 10 and M 11, M 12 we get:

$$\begin{array}{llll} +1\cdot603\,\pi & (+0\cdot501\,\alpha & -1\cdot924\,\delta) = +0''\cdot550 & -0\cdot046\,\text{P.} \\ -1\cdot730 & (+0\cdot512 & -1\cdot919\ ) = +0\cdot280 & -0\cdot057\,\text{G.} \end{array}$$

leading to the normals:

$$\begin{array}{lllllll} +3\cdot039\,\pi & +0\cdot097\,\kappa & = +0''\cdot290 & +0\cdot050\,\text{G.} & -0\cdot044\,\text{P.} & +0\cdot249\,\kappa' \\ +0\cdot097 & +1\cdot100 & +0\cdot471 & -0\cdot029 & -0\cdot028 & -0\cdot144 \end{array}$$

and

$$+3\cdot030\,\pi = +0''\cdot248 \quad +0\cdot053\,\text{G.} \quad -0\cdot042\,\text{P.} \quad +0\cdot262\,\kappa'.$$

Combination XXVII.—November 10.

The equations N 1, N 2, N 3, N 4, N 5, N 6 give:

$$\begin{array}{llll} +1\cdot706\,\pi & (+1\cdot328\,\alpha & -1\cdot173\,\delta) = -0''\cdot962 & +0\cdot060\,\text{P.} \\ -1\cdot611 & (+1\cdot354 & -1\cdot198\ ) & -0\cdot943 \quad +0\cdot070\,\text{F.} \\ -0\cdot259 & (+1\cdot371 & -1\cdot230\ ) & -0\cdot963 \quad +0\cdot075\,\text{E.} \end{array}$$

and the normals:

$$\begin{array}{lllllll} +3\cdot705\,\pi & -0\cdot469\,\kappa & = +0''\cdot426 & -0\cdot009\,\text{E.} & -0\cdot090\,\text{F.} & +0\cdot056\,\text{P.} & +0\cdot305\,\kappa' \\ -0\cdot469 & +1\cdot800 & -1\cdot719 & +0\cdot034 & +0\cdot056 & +0\cdot033 & +0\cdot028 \end{array}$$

from which

$$+3\cdot583\,\pi = -0''\cdot021 \quad +0\cdot000\,\text{E.} \quad -0\cdot075\,\text{F.} \quad +0\cdot066\,\text{P.} \quad +0\cdot312\,\kappa'.$$

Combination XXVIII.—November 11.

With the equations N 7, N 8, N 9, N 10, N 11, N 12, N 13, N 14 we get:

$$\begin{array}{llll} +1\cdot747\,\pi & (+1\cdot390\,\alpha & -1\cdot271\,\delta) = -0''\cdot804 & +0\cdot080\,\text{P.} \\ -1\cdot626 & (+1\cdot400 & -1\cdot291\ ) & -0\cdot547 \quad +0\cdot091\,\text{G.} \\ +1\cdot628 & (+1\cdot395 & -1\cdot295\ ) & -1\cdot048 \quad +0\cdot084\,\text{E.} \\ -0\cdot176 & (+1\cdot395 & -1\cdot317\ ) & -0\cdot954 \quad +0\cdot091\,\text{E.} \end{array}$$

whence the normals:

$$\begin{array}{lllllll} +4\cdot358\,\pi & +1\cdot376\,\kappa & = -1''\cdot479 & +0\cdot075\,\text{E.} & -0\cdot052\,\text{G.} & +0\cdot084\,\text{P.} & +0\cdot295\,\kappa' \\ +1\cdot376 & +2\cdot000 & -1\cdot731 & +0\cdot091 & +0\cdot032 & +0\cdot048 & +0\cdot030 \end{array}$$

and

$$+3\cdot412\,\pi = -0''\cdot288 \quad +0\cdot012\,\text{E.} \quad -0\cdot074\,\text{G.} \quad +0\cdot051\,\text{P.} \quad +0\cdot274\,\kappa'.$$

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Combination XXIX.—November 12.

The equations N 15, N 16, N 17, N 18, N 19, N 20, N 21, N 22 give:

$$\begin{array}{llll} +1\cdot778\,\pi & (+1\cdot383\,\alpha & -1\cdot347\,\delta) = -0''\cdot653 & +0\cdot093\,\text{P.} \\ -1\cdot709 & (+1\cdot373 & -1\cdot361\ ) & -0\cdot675 \quad +0\cdot099\,\text{F.} \\ +1\cdot215 & (+1\cdot370 & -1\cdot365\ ) & -0\cdot685 \quad +0\cdot095\,\text{E.} \\ -0\cdot172 & (+1\cdot354 & -1\cdot372\ ) & -0\cdot875 \quad +0\cdot098\,\text{E.} \end{array}$$

leading to the normals:

$$\begin{array}{lllllll} +6\cdot812\,\pi & -0\cdot761\,\kappa = +0''\cdot554 & +0\cdot053\,\text{E.} & -0\cdot237\,\text{F.} & +0\cdot099\,\text{P.} & +0\cdot260\,\kappa' \\ -0\cdot761 & +3\cdot150 & -2\cdot240 & +0\cdot112 & +0\cdot139 & +0\cdot056 & -0\cdot055 \end{array}$$

and

$$+6\cdot628\,\pi = +0''\cdot014 \quad +0\cdot080\,\text{E.} \quad -0\cdot204\,\text{F.} \quad +0\cdot113\,\text{P.} \quad +0\cdot247\,\kappa'.$$

Combination XXX.—November 13.

Taking the equations N 23, N 24, N 25, N 26, N 27, N 28, we find:

$$\begin{array}{llll} +1\cdot016\,\pi & (+1\cdot305\,\alpha & -1\cdot378\,\delta) = -0''\cdot377 & +0\cdot092\,\text{S.} \\ -1\cdot653 & (+1\cdot296 & -1\cdot378\ ) & -1\cdot212 \quad +0\cdot095\,\text{G.} \\ +1\cdot606 & (+1\cdot303 & -1\cdot376\ ) & -1\cdot504 \quad +0\cdot091\,\text{E.} \end{array}$$

and the normals:

$$\begin{array}{lllllll} +5\cdot009\,\pi & -0\cdot794\,\kappa = +0''\cdot962 & +0\cdot080\,\text{E.} & -0\cdot189\,\text{G.} & +0\cdot028\,\text{S.} & +0\cdot021\,\kappa' \\ -0\cdot794 & +2\cdot050 & -2\cdot391 & +0\cdot050 & +0\cdot114 & +0\cdot027 & +0\cdot021 \end{array}$$

and

$$+4\cdot701\,\pi = +0''\cdot036 \quad +0\cdot099\,\text{E.} \quad -0\cdot145\,\text{G.} \quad +0\cdot038\,\text{S.} \quad +0\cdot029\,\kappa'.$$

Combination XXXI.—November 23.

With the equations R 1, R 2, R 3, R 4 we deduce:

$$\begin{array}{llll} -1\cdot588\,\pi & (+0\cdot449\,\alpha & -1\cdot900\,\delta) = -0''\cdot794 & +0\cdot040\,\text{G.} \\ +1\cdot084 & (+0\cdot445 & -1\cdot903\ ) & -0\cdot783 \quad +0\cdot036\,\text{E.} \end{array}$$

whence the normals:

$$\begin{array}{lllllll} +2\cdot243\,\pi & -0\cdot867\,\kappa = -0''\cdot831 & +0\cdot012\,\text{E.} & -0\cdot048\,\text{G.} & -0\cdot013\,\kappa' \\ -0\cdot867 & +1\cdot050 & +0\cdot690 & +0\cdot011 & +0\cdot030 & -0\cdot012 \end{array}$$

and

$$+1\cdot527\,\pi = +0''\cdot004 \quad +0\cdot021\,\text{E.} \quad -0\cdot023\,\text{G.} \quad -0\cdot023\,\kappa'.$$

Combination XXXII.—December 5–6.

The equations T 3, T 4, T 5, T 6, T 7, T 8 give:

$$\begin{array}{llll} -1\cdot496\,\pi & (-0\cdot830\,\alpha & -1\cdot824\,\delta) = -1''\cdot013 & +0\cdot570\,\text{G.} \\ +1\cdot445 & (-0\cdot828 & -1\cdot798\ ) & -0\cdot590 \quad +0\cdot070\,\text{P.} \\ -1\cdot404 & (-0\cdot828 & -1\cdot793\ ) & -0\cdot857 \quad -0\cdot018\,\text{F.} \end{array}$$

furnishing the normals:

$$\begin{array}{lllllll} +4\cdot281\,\pi & -1\cdot191\,\kappa = +1''\cdot484 & +0\cdot010\,\text{F.} & -0\cdot852\,\text{G.} & +0\cdot061\,\text{P.} & -1\cdot060\,\kappa' \\ -1\cdot191 & +2\cdot000 & -1\cdot710 & -0\cdot007 & +0\cdot570 & +0\cdot042 & +0\cdot704 \end{array}$$

and the final equation:

$$+3\cdot571\,\pi = +0''\cdot465 \quad +0\cdot006\,\text{F.} \quad -0\cdot512\,\text{G.} \quad +0\cdot086\,\text{P.} \quad -0\cdot641\,\kappa'.$$

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Combination XXXIII.—December 7.

Taking the equations T 9, T 10, T 11, T 12, we get:

$$\begin{array}{llll} +1\cdot452\,\pi & (+0\cdot887\,\alpha & -1\cdot794\,\delta) = -0''\cdot570 & -0\cdot520\,\text{P.} \\ -1\cdot477 & (+0\cdot897 & -1\cdot761\ ) & -0\cdot429 \quad -0\cdot642\,\text{G.} \end{array}$$

which lead to the normals:

$$\begin{array}{llllll} +3\cdot774\,\pi & -0\cdot974\,\kappa = +0''\cdot304 & +1\cdot136\,\text{G.} & -0\cdot416\,\text{P.} & +0\cdot388\,\kappa' \\ -0\cdot974 & +1\cdot750 & -0\cdot828 & -0\cdot770 & -0\cdot286 & -0\cdot264 \end{array}$$

and

$$+3\cdot232\,\pi = -0''\cdot157 \quad +0\cdot707\,\text{G.} \quad -0\cdot575\,\text{P.} \quad +0\cdot246\,\kappa'.$$

Combination XXXIV.—October 17.

With the equations W 3, W 4, W 5, W 6, we find:

$$\begin{array}{llll} -0\cdot428\,\pi & (-1\cdot415\,\alpha & -1\cdot179\,\delta) = -1''\cdot243 & +0\cdot192\,\text{H.} \\ +1\cdot530 & (-1\cdot481 & -1\cdot157\ ) & -1\cdot078 \quad +0\cdot134 \end{array}$$

giving the normals:

$$\begin{array}{llllll} +1\cdot135\,\pi & +0\cdot495\,\kappa = -0''\cdot502 & +0\cdot055\,\text{H.} & -0\cdot206\,\kappa' \\ +0\cdot495 & +0\cdot900 & -1\cdot045 & +0\cdot146 & -0\cdot135 \end{array}$$

and

$$+0\cdot863\,\pi = +0''\cdot072 \quad -0\cdot025\,\text{H.} \quad -0\cdot133\,\kappa'.$$

Combination XXXV.—October 18.

With the equations W 7, W 8, W 9, W 10, we derive:

$$\begin{array}{llll} -0\cdot543\,\pi & (-1\cdot510\,\alpha & -1\cdot116\,\delta) = -0''\cdot952 & +0\cdot013\,\text{H.} \\ +1\cdot551 & (-1\cdot521 & -1\cdot098\ ) & -0\cdot837 \quad -0\cdot045 \end{array}$$

leading to the normals:

$$\begin{array}{llllll} +1\cdot215\,\pi & +0\cdot453\,\kappa = -0''\cdot352 & -0\cdot034\,\text{H.} & -0\cdot224\,\kappa' \\ +0\cdot453 & +0\cdot900 & -0\cdot806 & -0\cdot014 & -0\cdot145 \end{array}$$

and

$$+0\cdot987\,\pi = +0''\cdot054 \quad -0\cdot027\,\text{H.} \quad -0\cdot151\,\kappa'.$$

Combination XXXVI.—October 20–21.

Taking the equations W 11, W 12, W 13, W 14, W 15, W 16, we get:

$$\begin{array}{llll} +1\cdot628\,\pi & (-1\cdot590\,\alpha & -0\cdot988\,\delta) = -0''\cdot308 & -0\cdot508\,\text{H.} \\ -0\cdot432 & (-1\cdot621 & -0\cdot929\ ) & -0\cdot098 \quad -0\cdot792 \\ +1\cdot530 & (-1\cdot631 & -0\cdot904\ ) & -0\cdot241 \quad -0\cdot946 \end{array}$$

giving the normals:

$$\begin{array}{llllll} +2\cdot326\,\pi & +1\cdot227\,\kappa = -0''\cdot372 & -0\cdot870\,\text{H.} & +0\cdot363\,\kappa \\ +1\cdot227 & +1\cdot350 & -0\cdot290 & -1\cdot013 & +0\cdot217 \end{array}$$

and

$$+1\cdot211\,\pi = -0''\cdot109 \quad +0\cdot051\,\text{H.} \quad +0\cdot165\,\kappa'.$$

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Combination XXXVII.—October 29.

With the equations X 1, X 2, X 3, X 4, we find:

$$\begin{array}{llll} -0{\cdot}714\,\pi & (-1{\cdot}722\,\alpha & -0{\cdot}706\,\delta) = -0''{\cdot}144 & +0{\cdot}723\,\mathrm{H.} \\ +1{\cdot}520 & (-1{\cdot}703 & -0{\cdot}761\ ) & -0{\cdot}597 \quad +0{\cdot}594 \end{array}$$

and the normals:

$$\begin{array}{llll} +1{\cdot}271\,\pi & +0{\cdot}361\,\kappa = -0''{\cdot}362 & +0{\cdot}171\,\mathrm{H.} & -0{\cdot}183\,\kappa' \\ +0{\cdot}361 & +0{\cdot}900 \quad -0{\cdot}334 & +0{\cdot}593 & -0{\cdot}121 \end{array}$$

giving

$$+1{\cdot}126\,\pi = -0''{\cdot}228 \quad -0{\cdot}067\,\mathrm{H.} \quad -0{\cdot}134\,\kappa'.$$

Combination XXXVIII.—October 30.

Using the equations X 5, X 6, X 7, X 8, we get:

$$\begin{array}{llll} -0{\cdot}589\,\pi & (-1{\cdot}670\,\alpha & -0{\cdot}856\,\delta) = -0''{\cdot}051 & +0{\cdot}352\,\mathrm{H.} \\ +1{\cdot}550 & (-1{\cdot}663 & -0{\cdot}876\ ) & +0{\cdot}212 \quad +0{\cdot}276 \end{array}$$

which lead to the normals:

$$\begin{array}{llll} +1{\cdot}236\,\pi & +0{\cdot}432\,\kappa = +0''{\cdot}162 & +0{\cdot}099\,\mathrm{H.} & -0{\cdot}188\,\kappa' \\ +0{\cdot}432 & +0{\cdot}900 \quad +0{\cdot}072 & +0{\cdot}282 & -0{\cdot}121 \end{array}$$

and

$$+1{\cdot}029\,\pi = +0''{\cdot}127 \quad -0{\cdot}036\,\mathrm{H.} \quad -0{\cdot}130\,\kappa'.$$

Combination XXXIX.—October 31.

The equations X 9, X 10, X 11, X 12, lead to the following:

$$\begin{array}{llll} -0{\cdot}598\,\pi & (-1{\cdot}651\,\alpha & -0{\cdot}909\,\delta) = -0''{\cdot}278 & +0{\cdot}108\,\mathrm{H.} \\ +1{\cdot}688 & (-1{\cdot}649 & -0{\cdot}914\ ) & -0{\cdot}252 \quad +0{\cdot}039 \end{array}$$

which give the normals:

$$\begin{array}{llll} +0{\cdot}587\,\pi & -0{\cdot}017\,\kappa = +0''{\cdot}011 & -0{\cdot}019\,\mathrm{H.} & -0{\cdot}076\,\kappa' \\ -0{\cdot}017 & +0{\cdot}600 \quad -0{\cdot}163 & +0{\cdot}055 & -0{\cdot}045 \end{array}$$

and

$$+0{\cdot}587\,\pi = +0''{\cdot}006 \quad -0{\cdot}017\,\mathrm{H.} \quad -0{\cdot}077\,\kappa'.$$

Combination XL.—November 1.

With the equations X 13, X 14, X 15, X 16, we deduce:

$$\begin{array}{llll} -0{\cdot}538\,\pi & (-1{\cdot}656\,\alpha & -0{\cdot}902\,\delta) = +0''{\cdot}354 & -0{\cdot}112\,\mathrm{H.} \\ +1{\cdot}591 & (-1{\cdot}661 & -0{\cdot}886\ ) & +0{\cdot}083 \quad -0{\cdot}180 \end{array}$$

which give the normals:

$$\begin{array}{llll} +1{\cdot}227\,\pi & +0{\cdot}555\,\kappa = +0''{\cdot}002 & -0{\cdot}111\,\mathrm{H.} & -0{\cdot}193\,\kappa' \\ +0{\cdot}555 & +0{\cdot}750 \quad +0{\cdot}143 & -0{\cdot}115 & -0{\cdot}121 \end{array}$$

and

$$+0{\cdot}816\,\pi = -0''{\cdot}104 \quad -0{\cdot}026\,\mathrm{H.} \quad -0{\cdot}103\,\kappa'.$$

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Combination XLI.—November 13–14.

The equations Z 1, Z 2, Z 3, Z 4, Z 5, Z 6, lead to the following:

$$\begin{array}{llll} -1{\cdot}364\,\pi & (-1{\cdot}722\,a & +0{\cdot}628\,\delta) = +1''{\cdot}262 & +0{\cdot}138\,\text{H.} \\ +0{\cdot}908 & (-1{\cdot}751 & +0{\cdot}591\ ) \quad +0{\cdot}565 & +0{\cdot}124 \\ -1{\cdot}251 & (-1{\cdot}799 & +0{\cdot}525\ ) \quad +0{\cdot}374 & +0{\cdot}094 \end{array}$$

which furnish the normals:

$$\begin{array}{lllll} +1{\cdot}913\,\pi & -0{\cdot}768\,\kappa = -0''{\cdot}754 & -0{\cdot}087\,\text{H.} & +0{\cdot}228\,\kappa' \\ -0{\cdot}768 & +1{\cdot}350 \quad +0{\cdot}990 & +0{\cdot}160 & -0{\cdot}195 \end{array}$$

and

$$+1{\cdot}476 = -0''{\cdot}190 \quad +0{\cdot}004\,\text{H.} \quad +0{\cdot}117\,\kappa'.$$

Combination XLII.—November 16–17.

Taking the equations Z 7, Z 8, Z 9, Z 10, Z 11, Z 12, we get:

$$\begin{array}{llll} +0{\cdot}996\,\pi & (-1{\cdot}805\,a & +0{\cdot}477\,\delta) = +0''{\cdot}437 & -0{\cdot}015\,\text{H.} \\ -1{\cdot}216 & (-1{\cdot}770 & +0{\cdot}504\ ) \quad +0{\cdot}714 & -0{\cdot}040 \\ +0{\cdot}874 & (-1{\cdot}753 & +0{\cdot}523\ ) \quad +0{\cdot}621 & -0{\cdot}050 \end{array}$$

from which we derive the normals:

$$\begin{array}{lllll} +1{\cdot}457\,\pi & +0{\cdot}294\,\kappa = +0''{\cdot}045 & -0{\cdot}005\,\text{H.} & +0{\cdot}204\,\kappa' \\ +0{\cdot}294 & +1{\cdot}350 \quad +0{\cdot}799 & -0{\cdot}047 & +0{\cdot}189 \end{array}$$

and

$$+1{\cdot}393\,\pi = -0''{\cdot}129 \quad +0{\cdot}005\,\text{H.} \quad +0{\cdot}163\,\kappa'.$$

Collecting together the final equations as first derived, we find if we disregard the terms in a', δ' and κ':

Combination.	Final Equations from "Single Star" Combinations.							
I.	1·017 π =	− 0·043	+ 0·01 E.	... F.	... G.	... H.	... P.	... S.
II.	2·345	− 0·101	+ 0·41	...	− 0·61	...	+ 0·34	..
III.	1·687	− 0·160	...	...	+ 0·76	...	− 0·54	
IV.	2·315	+ 0·348	...	...	− 1·61	...	+ 0·80	...
V.	0·617	+ 0·070	...	+ 0·48	...	..	− 0·43	...
VI.	2·732	− 0·113	− 1·35	+ 2·31	...	...	...	− 0·88
VII.	0·403	+ 0·128	− 0·09	...	...	...	...	..
VIII.	0·859	+ 0·148	− 0·04	+ 0·01	...	...	...	...
IX.	1·658	− 0·194	...	...	+ 0·58	...	− 0·53	...
X.	0·577	+ 0·108	...	+ 0·76	...	− 0·84	...	...
XI.	0·596	+ 0·063	...	...	...	− 0·91	...	..
XII.	2·026	+ 0·076	...	− 3·74	...	+ 4·57	...	...
XIII.	1·353	+ 0·232	...	...	− 1·97	+ 0·46	+ 1·08	...
XIV.	0·245	− 0·123	+ 0·01	...	...	...	...	...
XV.	1·234	− 0·381	...	+ 1·00	...	...	− 0·92	...
XVI.	0·458	+ 0·151	...	...	...	− 0·23	+ 0·17	...
Sum:	20·122 π	+ 0·209	− 1·05 E.	+ 0·82 F.	− 2·85 G.	+ 3·05 H.	− 0·03 P.	− 0·88 S.

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Combination.	Final Equations from "Opposite Star" Combinations.							
XVII.	0·886 π =	+ 0·238	− 0·033 E.	+ 0·034 F.	... G.	... H.	... P.	... S.
XVIII.	4·520	+ 0·151	− 0·055	+ 0·018	+ 0·037	...	...	...
XIX.	2·616	+ 0·097	− 0·118	+ 0·246	...	...	− 0·219	...
XX.	2·378	+ 0·132	+ 0·110	...	− 0·111	...	...	...
XXI.	3·772	+ 0·352	+ 0·158	− 0·216	...	...	...	+ 0·052
XXII.	2·920	+ 0·329	+ 0·108	...	− 0·111	...	...	...
XXIII.	3·732	− 0·089	− 0·146	...	+ 0·160	...	...	...
XXIV.	3·371	− 0·035	− 0·016	+ 0·008	...	...	...	...
XXV.	8·288	+ 0·477	+ 0·038	...	− 0·132	...	+ 0·054	...
XXVI.	3·030	+ 0·248	...	...	+ 0·053	...	− 0·042	...
XXVII.	3·583	− 0·021	+ 0·000	− 0·075	...	...	+ 0·066	...
XXVIII.	3·412	− 0·288	+ 0·012	...	− 0·074	...	+ 0·051	...
XXIX.	6·628	+ 0·014	+ 0·080	− 0·204	...	...	+ 0·113	...
XXX.	4·701	+ 0·036	+ 0·099	...	− 0·145	...	...	+ 0·038
XXXI.	1·527	+ 0·004	+ 0·021	...	− 0·023	...	...	...
XXXII.	3·571	+ 0·465	...	+ 0·006	− 0·512	...	+ 0·086	...
XXXIII.	3·232	− 0·157	...	...	+ 0·707	...	− 0·575	...
XXXIV.	0·863	+ 0·072	...	...	...	− 0·025	...	...
XXXV.	0·987	+ 0·054	...	...	...	− 0·027	...	...
XXXVI.	1·211	− 0·109	...	...	...	+ 0·051	...	...
XXXVII.	1·126	− 0·228	...	...	...	− 0·067	...	...
XXXVIII.	1·029	+ 0·127	...	...	...	− 0·036	...	...
XXXIX.	0·587	+ 0·006	...	...	...	− 0·017	...	...
XL.	0·816	− 0·104	...	...	...	− 0·026	...	...
XLI.	1·476	− 0·190	...	...	...	+ 0·004	...	...
XLII.	1·393	− 0·129	...	...	...	+ 0·005	...	...
Sum:	71·655 π =	+ 1·452	+ 0·258 E.	− 0·183 F.	− 0·151 G.	− 0·138 H.	− 0·466 P.	+ 0·090 S.

Introducing the same values for E, F, &c., as before, the absolute terms become $+0''\cdot189$ and $+1''\cdot466$ for the "single star" and "opposite star" combinations respectively. On the same assumption, also, for the probable error of these personal error terms the weight of the "single star" result is 6·2, or, as before, about one-third of the original weight. With this value of one-third we get a final equation:

$$78\cdot362\,\pi = +\,1''\cdot522 \quad -0\cdot092\,\mathrm{E.} \quad +0\cdot090\,\mathrm{F.} \quad -1\cdot101\,\mathrm{G.} \quad +0\cdot879\,\mathrm{H.} \quad -0\cdot476\,\mathrm{P.} \quad -0\cdot203\,\mathrm{S.}$$

The absolute term becomes $+1''\cdot529$ with the personal error terms, and hence

$$\pi = +\,0''\cdot0194 \text{ or } +\,0''\cdot0195$$

according as these terms are excluded or included, so that in this case also their effect has quite disappeared. We may, therefore, take as the result of this discussion by "simultaneous combinations" a correction of $+0''\cdot017$ to the assumed value $8''\cdot800$, and including the correction $-0''\cdot003$ for distance the mean solar parallax becomes

$$8''\cdot814.$$

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The several combinations give the separate values:—

Combination.	Without Personal Errors.	With Personal Errors.	Weight.	Combination.	Without Personal Errors.	With Personal Errors.	Weight.
	″	″			″	″	
I.	8·760	8·762	0·339	XXII.	8·896	8·903	2·920
II.	8·759	8·782	0·782	XXIII.	8·776	8·769	3·732
III.	8·714	8·753	0·562	XXIV.	8·778	8·787	3·371
IV.	8·929	8·868	0·772	XXV.	8·848	8·847	8·288
V.	8·897	9·000	0·206	XXVI.	8·869	8·870	3·030
VI.	8·761	8·742	0·911	XXVII.	8·792	8·789	3·583
VII.	9·077	9·018	0·134	XXVIII.	8·723	8·722	3·412
VIII.	8·949	8·938	0·286	XXIX.	8·799	8·798	6·628
IX.	8·694	8·725	0·553	XXX.	8·804	8·807	4·701
X.	8·962	8·944	0·192	XXXI.	8·799	8·802	1·527
XI.	8·890	8·689	0·198	XXXII.	8·911	8·899	3·571
XII.	8·830	8·884	0·675	XXXIII.	8·754	8·774	3·232
XIII.	8·948	8·865	0·451	XXXIV.	8·871	8·867	0·863
XIV.	8·355	8·366	0·082	XXXV.	8·845	8·842	0·987
XV.	8·526	8·633	0·411	XXXVI.	8·717	8·723	1·211
XVI.	9·087	9·022	0·153	XXXVII.	8·619	8·611	1·126
XVII.	9·033	9·028	0·886	XXXVIII.	8·906	8·901	1·029
XVIII.	8·826	8·825	4·520	XXXIX.	8·806	8·802	0·587
XIX.	8·830	8·831	2·616	XL.	8·685	8·681	0·816
XX.	8·846	8·854	2·378	XLI.	8·684	8·684	1·476
XXI.	8·880	8·883	3·772	XLII.	8·715	8·716	1·393

The range of these values is naturally much greater than that of the several group results. Forming, however, the quantities $\Sigma\ (p\ vv)$ from the residuals from the mean value 8″·814 we get 0·428 or 0·379 without or with the personal error terms, and these give the probable error of a parallax result of weight unity ± 0″·069 and ± 0″·065 in the two cases, and the probable error of the mean result ± 0″·0078 or ± 0″·0073, which show that a still greater elimination of the casual ephemeris error has taken place in this solution, a result which might also have been expected.

12.—Concluding Remarks.

The two sets of values for the mean solar parallax derived from the two solutions "in groups" and "in combinations," viz., 8″·810 or 8″·809 and 8″·814 or 8″·815 respectively, would seem to indicate by their accordance that the variations of the ephemeris errors have had little influence on the result, or that, in other words, in the mean the series is sufficiently simultaneous. In the one solution—that "in groups,"—values have been derived for the variations of the ephemeris error, but it is evident that these are only computation results for the most part, and have only served to

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secure a close representation of the observations without professing to be the actual variations of the ephemeris errors. That these are in general quite small will be clear if we form their values for the *mean* epoch of each group, that is, reduce the values of a, δ and κ to these mean epochs. This leads to the following results, according as we disregard or include the systematic personal errors :—

			′	′	″	″
Group A.	Mean Epoch : October	11·20	a = − 0·303 or	− 0·033	δ = − 0·354 or	− 0·470
E.		24·31	− 0·243	− 0·331	− 0·119	− 0·311
F.		25·55	− 0·279	− 0·281	− 0·200	− 0·219
G.		26·64	− 0·092	− 0·052	− 0·225	− 0·081
L.	November	5·61	− 1·082	− 0·867	− 0·269	− 0·257
Q.		20·74	− 0·097	− 0·582	+ 0·270	+ 0·246
S.	December	1·75	− 0·461	− 0·048	+ 0·707	+ 0·689
U.		10·09	+ 0·431	+ 0·702	+ 0·210	+ 0·541
				′	″	
C.	October	17·30		κ = − 0·353 or	− 0·324	
D.		21·54		− 0·340	− 0·335	
H.		29·61		− 0·089	− 0·110	
I.		31·51		− 0·039	− 0·051	
J.	November	2·26		− 0·042	− 0·011	
K.		3·51		+ 0·015	+ 0·015	
M.		8·06		− 0·253	− 0·256	
N.		12·07		+ 0·366	+ 0·358	
R.		23·75		+ 0·406	+ 0·408	
T.	December	6·32		+ 0·339	+ 0·343	
W.	October	19·06		+ 0·359	+ 0·370	
X.		31·53		− 0·015	− 0·024	
Z.	November	15·67		+ 0·090	+ 0·107	

It might, therefore, be thought desirable to introduce values for the ephemeris variations deduced from these mean corrections, rather than adopt those resulting from each separate group, but, on the whole, it seems to me preferable to have, perhaps, eliminated too much rather than too little, which latter might be the case in using values derived from the above table ; and, furthermore, it must be noticed that no really legitimate values for the, by far the most important, groups of the "opposite star" series can thus be obtained, as the κ quantities represent the ephemeris correction in considerably differing directions, the last three from the Yale diurnal series being about at right angles to the principal series.

For the solution "in simultaneous combinations" the variations of the ephemeris corrections have been disregarded in the results given in the preceding section. It will be pretty apparent, from an inspection of the co-efficients of a', δ' and κ' in the final equations for π, together with the preceding values of a, δ, and κ, that their effect cannot be significant, and this is borne out, for the "single star" combinations, at least, if we derive values for a' and δ' from those of a and δ for the mean epochs of the

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"single star" groups given above. These data, however, are clearly inadequate to furnish anything more than an empirical correction to the ephemeris, which, it will be remembered, is already affected by a similar correction, and I have therefore contented myself with drawing simple curves through the plotted values of α and δ of the above table. This leads to the following results for α' and δ', according as the personal error terms are disregarded or included, and hence their effect, Δn, on the absolute term of the final equations for π :—

Combination.	Date.	Without Personal Errors.			With Personal Errors.		
		α'	δ'	Δn	α'	δ'	Δn
I.	Oct. 10–11	+0·03	—0·00	+0·002	+0·01	—0·00	+0·001
II.	24	—0·03	+0·01	—0·012	—0·04	+0·01	—0·016
III.	26	—0·05	+0·01	—0·010	—0·06	+0·01	—0·011
IV.	Nov. 5	—0·00	+0·01	—0·002	—0·01	+0·01	—0·004
V.	18	+0·04	+0·02	—0·002	+0·03	+0·02	—0·002
VI.	20	+0·05	+0·02	—0·001	+0·04	+0·02	—0·001
VII.	21	+0·05	+0·02	—0·002	+0·05	+0·02	—0·002
VIII.	22	+0·05	+0·02	+0·007	+0·05	+0·02	+0·007
IX.	28–29	+0·05	+0·03	—0·016	+0·06	+0·03	—0·018
X.	30	+0·05	+0·03	+0·003	+0·06	+0·03	+0·003
XI.	Dec. 1	+0·05	+0·03	+0·008	+0·06	+0·03	+0·010
XII.	2	+0·05	+0·03	+0·012	+0·06	+0·03	+0·013
XIII.	3–4	+0·05	+0·03	—0·019	+0·07	+0·03	—0·023
XIV.	6	+0·05	+0·04	—0·001	+0·07	+0·04	+0·001
XV.	8	+0·05	+0·04	—0·000	+0·07	+0·04	+0·001
XVI.	12–13	+0·05	+0·04	—0·002	+0·07	+0·04	—0·003
			Sum :	—0·035		Sum :	—0·046

The summed up final equation for π from the "single star" combinations is therefore

$$20{\cdot}122\,\pi = +0''{\cdot}174 \text{ or } +0''{\cdot}143$$

and giving it one-third weight as before in combining it with the "opposite star" equations, the final equation from both classes becomes

$$78{\cdot}362\,\pi = +1''{\cdot}510 \text{ or } +1''{\cdot}514$$

leading to

$$\pi = +0''{\cdot}0192 \text{ or } +0''{\cdot}0193$$

or practically to no change in the concluded mean solar parallax of 8″·814.

Concerning the possible effect of personal errors in the distance measures which, it is highly probable, were present in the Iris series as well as in the ones on Victoria and Sappho and the Victoria comparison stars, I can only state my conviction that the results depending upon measures of opposite and nearly equally distant and brilliant stars must be nearly free from such errors whatever may be their law. And I think this conviction will be shared by anyone who examines the general plan of these

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"opposite star" measures and the tables given by Dr. Gill for the systematic errors of the various observers as found in the Victoria triangulation, remembering all the while that, on account of the average greater brightness of the Iris stars, the effect of these errors is likely to be considerably smaller for them. On the other hand, it is equally clear that the results depending on measures from a single star are largely effected with these errors, and it is probable that the law adopted for them is but a very rude approximation. In last instance, therefore, it may seem desirable to take into consideration the values derived from the "opposite star" measures alone, which are namely, from the solution "in groups," as readily derived from the foregoing data—

$$8''\cdot814 \text{ or } 8''\cdot815$$

and from that "in combinations"

$$8''\cdot815 \text{ or } 8''\cdot815$$

according as the terms E, F, &c. are left out or introduced. The probable error for weight unity derived from the agreement of the several parallax results are for these four cases $\pm\ 0''\cdot076$, $\pm\ 0''\cdot075$, $\pm\ 0''\cdot075$ and $\pm\ 0''\cdot074$ respectively, and hence those for the above results are $\pm\ 0''\cdot0094$, $\pm\ 0''\cdot0093$, $\pm\ 0''\cdot0088$ and $\pm\ 0''\cdot0087$.

To recapitulate, therefore, the following results have been deduced in the preceding pages:—

	Mean Solar Parallax.	
Solution in groups, all measures	8·810 ±	0·0091
" " " " including personal errors	8·809	0·0085
" " "opposite star" measures only	8·814	0·0094
" " " " " " including personal errors ...	8·815	0·0093
" in combinations, all measures	8·814	0·0078
" " " " including personal errors	8·814	0·0073
" " "opposite star" measures only	8·815	0·0088
" " " " " " including personal errors	8·815	0·0087

The small range of these values relieves us of much responsibility in deciding upon the final result of the Iris series. As a compromise between the desirability of including all the available measures, as is done in the solution "in groups," and that of avoiding the uncertainty of the ephemeris over a considerable period, as does the solution "in combinations," we may take

$$8''\cdot812$$

as the final value, and its probable error appears not likely to be much greater than $\pm 0''\cdot009$.

At the opposition in 1888 the planet Iris appeared to my eye of a slightly reddish tint. No especial mention of this fact is made in the original records of the observations, as its possible importance did not occur to me at the time. And it was not until some years later that I enquired of the several observers whether they had also noticed

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the color. In 1891, Dr. Gill remembered to have been distinctly conscious of some peculiarity about Iris. But in 1895, Messrs. Finlay, Hall and Peter could recollect nothing whatever about the appearance of the planet in 1888. At the opposition of 1895, I examined Iris on several occasions, it then being a little below the eighth magnitude, and I then could see no distinct trace of color, nor could Dr. Chase. The extent of possible influence of difference of Iris and the comparison stars on the parallax must thus remain an open question until the mean refrangibility of the light of all the objects in question has been ascertained.

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VOL. I., PART 5.

DERIVATION OF THE SOLAR PARALLAX

FROM THE

MERIDIAN OBSERVATIONS,

BY

ARTHUR AUWERS.

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DERIVATION OF THE SOLAR PARALLAX FROM THE MERIDIAN OBSERVATIONS.

MERIDIAN OBSERVATIONS OF IRIS.

With the observations of the comparison stars for *Iris*, 191 meridian observations of the planet were made at the nine observatories on, altogether, 90 different days between September 7, 1888 and January 10, 1889, giving 189 observed Right Ascensions and an equal number of observed Declinations. Three isolated observations only however were secured before September 20, at Dublin, and ten observations only are scattered over the period following December 15, made at Pulkowa, Leipzig, and Dublin, thus leaving 178 observations from 77 days within the intermediate period of 87 days. The planet's distance from the Earth was less than unity from September 23 till December 8, but as the meridian observations were made for no other purpose than to determine the corrections of the ephemeris for the period covered by the heliometer observations, which were arranged to begin only on October 10, the southern observatories did not take up the meridian series at an earlier date, and actually secured observations, viz., 39 Right Ascensions and 40 Declinations, on 35 days only between October 15 and December 14, while the planet's distance decreased from 0·88 to 0·85 (October 31), and again increased till 1·04. For comparison with these 40 Declinations there are, using the northern observations from October 13 to December 15, 115 observations from 52 days. Only on half this number of days the planet was observed in both hemispheres.

Between the contributing observatories, the 191 observations are distributed as follows :—

Berlin	15 obs.								
Cape	32 „								
Dublin	26 „	(2 without Dec.); of these 7 (6 Dec.) before Oct. 13, 6 after Dec. 15							
Greenwich	18 „	(1 „ R.A.)							
Leiden	12 „		„	5	„	„			
Leipzig	39 „		„	10	„	„	2	„	„
Melbourne	8 „	(1 „ „)							
Oxford	18 „								
Pulkowa	23 „		„	13	„	„	2	„	„

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The observed Right Ascensions were reduced to what they should have been if the planet had been equal to an $8^m{\cdot}0$-star, using the variations with magnitude as tabulated, Vol. II., p. 451. Day corrections were determined from the comparison stars observed with the planet by comparing the observed Right Ascensions with the final normal values N_3, and reducing the differences to $8^m{\cdot}0$. For Declination, the comparison of the observed places with the N_3 gave at once the day correction. The planet's magnitude was taken in this reduction from the following ephemeris for Berlin midnight :—

Aug.	17	8·22	Sept.	26	7·49	Nov.	5	7·17	Dec.	15	7·65
	27	8·0	Oct.	6	7·34		15	7·22		25	7·83
Sept.	6	7·84		16	7·23		25	7·35	Jan.	4	8·02
	16	7·66		26	7·17	Dec.	5	7·49		14	8·22

The mean opposition magnitude has been assumed = 8·8, or $0^m{\cdot}4$ fainter than in the *Berliner Jahrbuch*. Only a few estimates were made with the observations of 1888, but they agree tolerably well in this correction, seven Oxford estimates, October 30—December 1, giving the mean opposition magnitude 8·7 and three Berlin estimates, December 7—13, giving 9·1. All these estimates were made after opposition, and no allowance has been made here for the planet's phase, which would explain part of the large differences between the estimates and of their deviation from the *Jahrbuch* magnitude—to what extent, however, cannot be stated without entering into an investigation which would be beyond the scope of the present discussion.

An opposition-ephemeris, comprising the period October 11—November 16, 1888, was first issued with the *Berliner Jahrbuch für 1890* (p. 481). Two observations however, made by Dr. Knorre with the equatorial at the observatory, Berlin, August 18 and 20, showed that Brünnow's tables from which the ephemeris had been computed were rather largely in error. The epoch of Brünnow's elements (M) was therefore corrected by $+38''{\cdot}5$ so as to represent Dr. Knorre's observations, and from osculating elements for August 14, derived from the tables with this correction, and having regard to the perturbations by Jupiter, Saturn, Mars, Earth and Venus, a new ephemeris (L_1) was at once computed at the *Jahrbuch* office, by Hr. Lange, for the period September 20 to December 21. With this ephemeris the observations were compared in a preliminary reduction, in which they were referred to preliminary normal star places, systematically differing from the definitive places N_3 by $+0^s{\cdot}003$ and $+0''{\cdot}21$, and only approximately corrected for magnitude equation, and the following mean corrections were found, giving weight 3 to Berlin or Leiden places, 1 to Oxford and Pulkowa, 2 to the rest :

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1888	Δα	p	Δδ	p	1888	Δα	p	Δδ	p
	s		″			s		″	
Sept. 22·2	+ 0·238	17	+ 0·19	17	Nov. 7·3	+ 0·620	18	+ 2·02	18
27·4	0·229	14	0·42	14	12·5	0·659	31	1·90	31
Oct. 2·6	0·228	18	1·08	16	16·9	0·689	13	1·77	12·
7·3	0·275	6	1·20	5·	20·9	0·632	23	2·59	23
13·8	0·318	12	1·12	12	26·9	0·729	22	2·26	22
18·5	0·430	22	1·35	22	Dec. 1·7	0·748	21	3·03	23
23·6	0·438	21	1·29	21	6·7	0·830	42	3·14	42
28·1	0·414	24	1·21	24	12·3	0·863	22	3·37	22
Nov. 1·1	0·553	13	0·95	13	19·2	0·946	6	4·38	6

The fractions of the day, in this table, are counted from the planet's transit over the Berlin meridian.

As the variation of error thus proved still to be considerable, the mean of Dr. Knorre's two observations was combined with four of the normal values given in the above table, viz., the first and the last and the intermediate values for October 18·5 and November 16·9, to correct all elements of Brünnow's orbit, except the longitude of the perihelion and the mean motion, which were retained unchanged. The corrections found were: $\delta M = (+ 38''\cdot5 - 0''\cdot66) = + 37''\cdot84$; $\delta\phi = + 4''\cdot29$; $\delta\Omega = - 22''\cdot30$; $\delta i = - 0''\cdot84$. With the elements thus corrected, a new ephemeris (L_2) was computed by Hr. Lange in 1890, directly for every second day from August 23 to January 12, retaining in the Right Ascension and Declination one decimal place more than in ephemeris L_1. The observations, as previously reduced, were compared with this new ephemeris by subtracting the difference $L_2 - L_1$ from the old comparison for the period September 20 to December 21, and those made before and after this period were directly compared. In this way the following corrections to the new ephemeris were found, assuming relative weights as before :—

M.T. Berl.	Δα	p	Δδ	p	M.T. Berl.	Δα	p	Δδ	p
	s		″			s		″	
Sept. 7·7	− 0·100	2	− 1·03	2	Nov. 7·8	+ 0·052	18	− 0·13	18
14·7	− 0·035	4	− 0·57	4	12·9	+ 0·078	31	+ 0·25	31
22·8	− 0·029	17	+ 0·42	17	17·3	+ 0·055	13	− 0·55	12·
28·0	− 0·026	14	− 0·13	14	21·3	+ 0·025	23	− 0·08	23
Oct. 3·2	− 0·102	18	+ 0·01	16	27·3	+ 0·040	22	− 0·39	22
7·8	− 0·096	6	− 0·22	5·	Dec. 2·1	+ 0·001	21	+ 0·20	23
14·4	− 0·062	12	+ 0·08	12	7·1	+ 0·022·	42	+ 0·18	42
19·0	− 0·050	22	− 0·29	22	12·6	+ 0·004	22	+ 0·11	22
24·1	− 0·043	21	− 0·39	21	19·7	+ 0·028	6	+ 0·41	5
28·6	− 0·061	24	− 0·44	24	28·4	− 0·019	10	+ 0·13	10
Nov. 1·6	+ 0·003	13	− 0·73	13	Jan. 10·3	− 0·125	2	+ 0·22	2

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The previous correction of four elements thus appearing entirely to have failed to represent the planet's path, 44 equations of condition were drawn up between the corrections of all the six elements of the orbit and the errors tabulated in this table, and from a least square solution of them the following apparent corrections to the elements used to compute ephemeris L_2 were found :—

$$\delta M = +\ 13''\!\cdot\!18 \text{ (August 14·0 Berl.).}$$
$$\delta\pi = -\ 1\cdot58$$
$$\delta\Omega = -\ 8\cdot88$$
$$\delta i = +\ 2\cdot11$$
$$\delta\phi = +\ 7\cdot55$$
$$\delta\mu = -\ 0\cdot14895$$

The corrections to ephemeris L_2 resulting from this change of elements were computed by differential formulæ for every fourth day, and interpolated from day to day. By applying these corrections to ephemeris L_2, the definitive ephemeris (L_3) was constructed.

As in the comparison of the observations the places corresponding to the last system of elements were found by adding to the places interpolated before from ephemeris L_1, the sum of the differences $L_2 - L_1$ and $L_3 - L_2$, each of these differences being interpolated separately for the time of observation between the values tabulated for Berlin midnight, the table of computed places is here given correspondingly as follows :—

Ephemeris of Iris 1888.

Berlin Midn.	Ephemeris L_1							$L_2 - L_1$		$L_3 - L_2$	
	App. R.A.			App. Dec.			Log Δ	Log r	Δα	Δδ	Δα	Δδ
	h m s	s	s	° ′ ″	′ ″	″			s	″	s	″
Sept. 17	2 34 28·34	+17·54		+24 6 26·2	+2 46·2		0·017718		+0·232	−0·32	−0·045	+0·30
18	34 45·88	15·41	−2·13	9 12·4	2 32·4	−13·8	014431	0·269729	+0·235	−0·39	−0·048	+0·26
19	35 1·29	13·25	2·16	11 44·8	2 18·4	14·0	011170		+0·236	−0·36	−0·050	+0·22
20	35 14·54	11·08	2·17	14 3·2	2 4·2	14·2	007936		+0·244	−0·30	−0·053	+0·19
21	35 25·62	8·88	2·20	16 7·4	1 49·7	14·5	004731		+0·248	−0·26	−0·055	+0·15
22	35 34·50	6·68	2·20	17 57·1	1 34·9	14·8	0·001557	0·268823	+0·263	−0·21	−0·057	+0·12
23	35 41·18	4·46	2·22	19 32·0	1 19·9	15·0	9·998417		+0·274	−0·10	−0·059	+0·08
24	35 45·64	2·24	2·22	20 51·9	1 4·7	15·2	995312		+0·289	+0·04	−0·061	+0·05
25	35 47·88	+ 0·02	2·22	21 56·6	0 49·1	15·6	992244		+0·297	+0·15	−0·062	+0·02
26	35 47·90	− 2·21	2·23	22 45·7	0 33·4	15·7	989215	0·267985	+0·293	+0·36	−0·064	−0·01
27	35 45·69	4·44	2·23	23 19·1	0 17·4	16·0	986228		+0·285	+0·49	−0·065	−0·04
28	35 41·25	6·68	2·24	23 36·5	+0 1·1	16·3	983286		+0·273	+0·60	−0·066	−0·07
29	35 34·57	8·91	2·23	23 37·6	−0 15·3	16·4	980391		+0·272	+0·78	−0·067	−0·10
30	35 25·66	11·13	2·22	23 22·3	0 31·9	16·6	977548	0·267215	+0·279	+0·89	−0·068	−0·12
Oct. 1	35 14·53	13·32	2·19	22 50·4	0 48·9	17·0	974757		+0·296	+0·90	−0·068	−0·15
2	35 1·21	15·49	2·17	22 1·5	1 6·0	17·1	972022		+0·313	+1·00	−0·069	−0·17
3	34 45·72	17·61	2·12	20 55·5	1 23·2	17·2	9·969344		+0·339	+1·13	−0·069	−0·19

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Berlin Midn.	Ephemeris L_1 App. R.A.			App. Dec.			Log Δ	Log r	$L_2 - L_1$ Δα	Δδ	$L_2 - L_2$ Δα	Δδ
	h m s	s	s	° ′ ″	′ ″	″			s	″	s	″
Oct. 4	2 34 28·11	−19·71	−2·10	+24 19 32·3	−1 40·6	−17·4	9·966728	0·266516	+0·353	+1·22	−0·069	−0·21
5	34 8·40	21·76	2·05	17 51·7	1 58·1	17·5	964174		+0·369	+1·31	−0·069	−0·23
6	33 46·64	23·75	1·99	15 53·6	2 15·6	17·5	961687		+0·379	+1·40	−0·068	−0·25
7	33 22·89	25·70	1·95	13 38·0	2 33·1	17·5	959271		+0·373	+1·44	−0·068	−0·27
8	32 57·19	27·59	1·89	11 4·9	2 50·8	17·7	956926	0·265888	+0·365	+1·40	−0·067	−0·29
9	32 29·60	29·44	1·85	8 14·1	3 8·2	17·4	954656		+0·351	+1·44	−0·066	−0·31
10	32 0·16	31·21	1·77	5 5·9	3 25·7	17·5	952463		+0·353	+1·32	−0·065	−0·32
11	31 28·95	32·92	1·71	1 40·2	3 43·1	17·4	950351		+0·353	+1·21	−0·064	−0·34
12	30 56·03	34·55	1·63	+23 57 57·1	4 0·5	17·4	948322	0·265334	+0·362	+1·08	−0·062	−0·35
13	30 21·48	36·11	1·56	53 56·6	4 17·8	17·3	946376		+0·373	+1·01	−0·060	−0·36
14	29 45·37	37·60	1·49	49 38·8	4 34·8	17·0	944518		+0·383	+1·04	−0·058	−0·37
15	29 7·77	39·02	1·42	45 4·0	4 51·7	16·9	942750		+0·393	+1·03	−0·056	−0·38
16	28 28·75	40·34	1·32	40 12·3	5 8·4	16·7	941073	0·264853	+0·420	+1·08	−0·054	−0·38
17	27 48·41	41·58	1·24	35 3·9	5 24·9	16·5	939491		+0·450	+1·22	−0·051	−0·39
18	27 6·83	42·71	1·13	29 39·0	5 41·1	16·2	938004		+0·483	+1·48	−0·049	−0·39
19	26 24·12	43·76	1·05	23 57·9	5 56·7	15·6	936616		+0·494	+1·81	−0·046	−0·39
20	25 40·36	44·72	0·96	18 1·2	6 12·0	15·3	935327	0·264446	+0·496	+1·92	−0·043	−0·39
21	24 55·64	45·58	0·86	11 49·2	6 27·0	15·0	934141		+0·498	+1·84	−0·040	−0·39
22	24 10·06	46·34	0·76	5 22·2	6 41·8	14·8	933058		+0·496	+1·69	−0·037	−0·38
23	23 23·72	47·00	0·66	+22 58 40·4	6 55·9	14·1	932082		+0·488	+1·71	−0·034	−0·38
24	22 36·72	47·54	0·54	51 44·5	7 9·7	13·8	931213	0·264114	+0·481	+1·65	−0·031	−0·38
25	21 49·18	48·00	0·46	44 34·8	7 22·8	13·1	930453		+0·462	+1·71	−0·028	−0·37
26	21 1·18	48·34	0·34	37 12·0	7 35·3	12·5	929803		+0·458	+1·73	−0·025	−0·36
27	20 12·84	48·57	0·23	29 36·7	7 47·3	12·0	929264		+0·459	+1·68	−0·022	−0·35
28	19 24·27	48·68	−0·11	21 49·4	7 58·6	11·3	928838	0·263859	+0·469	+1·67	−0·018	−0·34
29	18 35·59	48·68	0·00	13 50·8	8 9·1	10·5	928526		+0·484	+1·67	−0·015	−0·33
30	17 46·91	48·55	+0·13	5 41·7	8 19·1	10·0	928328		+0·509	+1·57	−0·012	−0·32
31	16 58·36	48·30	0·25	+21 57 22·6	8 28·2	9·1	928246		+0·530	+1·62	−0·008	−0·31
Nov. 1	16 10·06	47·93	0·37	48 54·4	8 36·5	8·3	928280	0·263680	+0·549	+1·68	−0·005	−0·29
2	15 22·13	47·44	0·49	40 17·9	8 43·9	7·4	928430		+0·566	+1·75	−0·002	−0·28
3	14 34·69	46·82	0·62	31 34·0	8 50·5	6·6	928696		+0·582	+1·78	+0·002	−0·26
4	13 47·87	46·09	0·73	22 43·5	8 56·2	5·7	929077		+0·585	+1·87	+0·005	−0·24
5	13 1·78	45·24	0·85	13 47·3	9 0·9	4·7	929574	0·263577	+0·582	+2·03	+0·008	−0·22
6	12 16·54	44·31	0·93	4 46·4	9 4·7	3·8	930187		+0·565	+2·12	+0·011	−0·20
7	11 32·23	43·26	1·05	+20 55 41·7	9 7·5	2·8	930910		+0·566	+2·20	+0·014	−0·18
8	10 48·97	42·11	1·15	46 34·2	9 9·4	1·9	931748		+0·571	+2·22	+0·017	−0·16
9	10 6·86	40·88	1·23	37 24·8	9 10·4	−1·0	932694	0·263550	+0·577	+2·22	+0·020	−0·14
10	9 25·98	39·54	1·34	28 14·4	9 10·3	+0·1	933751		+0·595	+2·19	+0·023	−0·12
11	8 46·44	38·11	1·43	19 4·1	9 9·6	0·7	934916		+0·603	+1·88	+0·025	−0·10
12	8 8·33	36·62	1·49	9 54·5	9 8·2	1·4	936186		+0·595	+1·55	+0·027	−0·08
13	7 31·71	35·05	1·57	0 46·3	9 6·0	2·2	937558	0·263602	+0·588	+1·38	+0·029	−0·06
14	6 56·66	33·43	1·62	+19 51 40·3	9 3·0	3·0	939032		+0·577	+1·42	+0·031	−0·04
15	6 23·23	31·74	1·69	42 37·3	8 59·2	3·8	940608		+0·583	+1·66	+0·033	−0·02
16	5 51·49	29·98	1·76	33 38·1	8 54·4	4·8	942283		+0·601	+2·07	+0·034	0·00
17	5 21·51	28·14	1·84	24 43·7	8 48·7	5·7	9·944053	0·263730	+0·621	+2·42	+0·036	+0·01

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Berlin Midn.	Ephemeris L_1 App. R.A.			App. Dec.			Log Δ	Log r	$L_2 - L_1$ Δα	Δδ	$L_3 - L_2$ Δα	Δδ
	h m s	s	s	° ′ ″	′ ″	″			s	″	s	″
Nov. 18	2 4 53·37	−26·25	+1·89	+19 15 55·0	−8 42·5	+6·2	9·945916		+0·617	+2·55	+0·037	+0·03
19	4 27·12	24·35	1·90	7 12·5	8 35·5	7·0	947870		+0·591	+2·69	+0·038	+0·04
20	4 2·77	22·41	1·94	+18 58 37·0	8 28·0	7·5	949913		+0·583	+2·70	+0·039	+0·06
21	3 40·36	20·42	1·99	50 9·0	8 19·7	8·3	952042	0·263934	+0·600	+2·74	+0·040	+0·07
22	3 19·94	18·37	2·05	41 49·3	8 10·9	8·8	954256		+0·633	+2·63	+0·041	+0·09
23	3 1·57	16·29	2·08	33 38·4	8 1·7	9·2	956551		+0·656	+2·48	+0·041	+0·10
24	2 45·28	14·17	2·12	25 36·7	7 51·9	9·8	958925		+0·672	+2·44	+0·042	+0·11
25	2 31·11	12·04	2·13	17 44·8	7 41·5	10·4	961375	0·264214	+0·674	+2·46	+0·042	+0·12
26	2 19·07	9·87	2·17	10 3·3	7 30·7	10·8	963898		+0·684	+2·47	+0·042	+0·13
27	2 9·20	7·69	2·18	2 32·6	7 19·4	11·3	966493		+0·687	+2·56	+0·041	+0·14
28	2 1·51	5·49	2·20	+17 55 13·2	7 7·6	11·8	969156		+0·696	+2·68	+0·041	+0·15
29	1 56·02	3·27	2·22	48 5·6	6 55·4	12·2	971885	0·264571	+0·709	+2·76	+0·040	+0·16
30	1 52·75	−1·03	2·24	41 10·2	6 42·9	12·5	974678		+0·724	+2·80	+0·039	+0·17
Dec. 1	1 51·72	+1·22	2·25	34 27·3	6 29·9	13·0	977532		+0·738	+2·90	+0·038	+0·17
2	1 52·94	3·49	2·27	27 57·4	6 16·6	13·3	980443		+0·757	+2·91	+0·037	+0·18
3	1 56·43	5·75	2·26	21 40·8	6 3·1	13·5	983409	0·265002	+0·767	+2·85	+0·035	+0·18
4	2 2·18	8·02	2·27	15 37·7	5 49·4	13·7	986428		+0·778	+2·83	+0·033	+0·18
5	2 10·20	10·27	2·25	9 48·3	5 35·4	14·0	989496		+0·783	+2·87	+0·031	+0·18
6	2 20·47	12·52	2·25	4 12·9	5 21·3	14·1	992611		+0·800	+2·88	+0·029	+0·18
7	2 32·99	14·77	2·25	+16 58 51·6	5 7·0	14·3	995771	0·265507	+0·819	+2·94	+0·027	+0·18
8	2 47·76	16·99	2·22	53 44·6	4 52·7	14·3	9·998972		+0·827	+2·99	+0·025	+0·18
9	3 4·75	19·20	2·21	48 51·9	4 38·3	14·4	0·002212		+0·838	+3·11	+0·022	+0·17
10	3 23·95	21·38	2·18	44 13·6	4 23·8	14·5	005489		+0·843	+3·23	+0·020	+0·17
11	3 45·33	23·55	2·17	39 49·8	4 9·4	14·4	008800	0·266086	+0·852	+3·27	+0·017	+0·16
12	4 8·88	25·68	2·13	35 40·4	3 54·9	14·5	012142		+0·854	+3·31	+0·014	+0·16
13	4 34·56	27·80	2·12	31 45·5	3 40·6	14·3	015514		+0·866	+3·25	+0·011	+0·15
14	5 2·36	29·89	2·09	28 4·9	3 26·3	14·3	018913		+0·874	+3·27	+0·008	+0·14
15	5 32·25	31·95	2·06	24 38·6	3 12·2	14·1	022338	0·266737	+0·882	+3·27	+0·005	+0·13
16	6 4·20	33·99	2·04	21 26·4	2 58·1	14·1	025787		+0·895	+3·34	+0·002	+0·12
17	6 38·19	36·00	2·01	18 28·3	2 44·1	14·0	029257		+0·903	+3·37	−0·002	+0·11
18	7 14·19	37·98	1·98	15 44·2	2 30·3	13·8	032748		+0·908	+3·35	−0·005	+0·10
19	7 52·17	39·93	1·95	13 13·9	2 16·7	13·6	036257	0·267460	+0·915	+3·34	−0·009	+0·08
20	8 32·10	41·86	1·93	10 57·2	2 3·2	13·5	039782		+0·931	+3·38	−0·013	+0·07
21	9 13·96	43·76	1·90	8 54·0	1 49·9	13·3	043322		+0·945	+3·42	−0·017	+0·06
22	9 57·72			7 4·1			0·046875		+0·960	+3·49	−0·021	+0·05

The following tables contain, for the separate series, the comparison of the observed places with the ephemeris L_3. The first columns give the data as they were communicated; after them, under the heading "Total Reduction," is given the adopted day correction, derived with the definitive star places N_3, and including the reduction of the planet's R.A. to $8^m{\cdot}0$, with the number of comparison stars used in the determination. When this number, being only small, is enclosed in brackets, the adopted value is a mean, taken with relative weights, according to the circumstances of the case, from the day correction furnished by the observed stars and the general mean correction of the series (reduced to $8^m{\cdot}0$ for R.A.), or, for the Cape series, the

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general mean reduction found for the individual observer. Whenever no number of stars is given, no comparison stars were observed, and the adopted reduction simply is the mean reduction, viz., the first term given in the table, Vol. II., p. 451, with a further correction $+0^{s}\cdot035$ for Cox's observation Dec. 6, combined with the reduction of the planet's R.A. to $8^{m}\cdot0$.* The parallax is computed with the constant $8''\cdot80$. The columns v and v', showing the outstanding errors, will be explained hereafter.

Individual Observations and Comparison with Ephemeris.

Berlin.

1888		Pos. Instr.	Obs. R.A.	No. wires	Obs. Dec.	Div. read	Im.	Remarks
			h m s		° ′ ″			
Oct.	19	II	2 26 23·808	25	+23 23 48·63	8	2–3	
	24	II	22 37·109	25	22 51 40·13	,,	2–3	
	25	IV	21 49·744	25	22 44 32·10	,,	2–3	
	28	IV	19 25·290	15	22 21 51·43	,,	2–3	
Nov.	9	III	10 9·601	15	20 37 49·74	,,	2–3	
	11	I	8 49·301	15	20 19 32·15	,,	3–4	
	12	I	8 11·258	24	20 10 24·37	,,	2–3	
	14	III	6 59·564	15	19 52 13·02	,,	3	Obs. hasty, chronograph disturbed.
	20	II	4 5·441	15	18 59 18·51	,,	2–3	Obs. hasty, cleared up suddenly.
Dec.	1	II	1 52·518	24	17 35 11·98	,,	1–2	
	4	IV	2 2·105	15	17 16 21·17	,,	1–2	
	5	IV	2 9·848	15	17 10 30·28	,,	2	
	7	III	2 32·019	25	16 59 32·08	,,	2–3	Est. mag. 7·7
	8	I	2 46·454	25	16 54 24·08	,,	2–3	,, 7·8
	13	III	4 31·442	15	16 32 17·95	,,	2	,, 8

1888		Total Reduction			Par.	R.A. Eph. L_3	Red. α — Eph.	Dec. Eph. L_3	Red. δ — Eph.	v'	
		s	″		″	s	s	″	″	s	″
Oct.	19	+0·040	+0·02	6	+4·91	23·855	—0·007	53·57	—0·01	+0·004	+0·05
	24	+ 33	—0·10	6	5·06	37·156	—0·014	45·65	—0·56	+0·006	—0·31
	25	+ 5	—0·06	7	5·09	49·772	—0·023	37·44	—0·31	+0·001	—0·02
	28	+ 25	—0·14	6	5·17	25·351	—0·036	56·79	—0·33	+0·003	+0·07
Nov.	9	+ 11	—0·05	7	5·39	9·618	—0·006	55·49	—0·41	—0·047	—0·43
	11	+ 35	—0·01	6	5·41	49·341	—0·005	38·04	—0·49	—0·028	—0·41
	12	+ 4	0·00	4	5·41	11·258	+0·004	29·81	—0·03	—0·007	+0·13
	14	+ 3	—0·19	3	5·42	59·599	—0·032	18·69	—0·44	—0·030	—0·16
	20	+ 1	+0·11	4	5·42	5·421	+0·021	24·04	0·00	+0·040	+0·47
Dec.	1	+ 9	+0·10	5	5·27	52·500	+0·027	17·39	—0·04	+0·022	+0·41
	4	+ 22	—0·12	10	5·21	2·137	—0·010	25·91	+0·35	—0·015	+0·70
	5	— 11	—0·03	2	5·18	9·850	—0·013	35·72	—0·29	—0·016	+0·02
	7	+ 5	—0·14	4	5·13	32·018	+0·006	37·11	—0·04	+0·008	+0·20
	8	+ 26	+0·07	2	5·11	46·455	+0·025	29·02	+0·24	+0·032	+0·46
	13	— 25	+0·07	3	4·96	31·454	—0·037	23·19	—0·21	—0·003	—0·11

* For more detailed explanations, see the discussion of the *Victoria* observations, the report on which was drawn up first.

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Cape of Good Hope.

1888	Obs.	M.T.C.	Observed Place		Total Reduction			Par.	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ —Eph.	v'	
		h m s	h m s	° ′ ″	s	″		—	s	s	″	″	s	″
Oct. 15	M	12 49 26	2 29 7·64	+23 45 10·83	−0·120	−1·24	6	8·46	7·527	−0·007	0·36	+0·77	+0·005	+0·67
16	C	12 44 51	28 28·63	40 17·45	+ 33	−0·11	6	8·48	28·641	+0·022	9·40	−0·54	+0·033	−0·62
22	C	12 16 59	24 10·81	5 36·29	+ 147	−1·08	6	8·59	10·853	+0·104	26·38	+0·24	+0·119	+0·41
26	C	11 58 7	21 2·56	22 37 31·30	− 50	−0·67	4	8·60	2·591	−0·081	22·48	−0·45	−0·051	−0·12
29	M	11 43 55	18 37·63	14 16·86	− 98	−0·06	5	8·59	37·527	+0·005	6·73	+1·48	+0·041	+1·92
30	C	11 39 11	17 48·89	6 8·88	+ 14	−1·47	5	8·58	49·033	−0·129	59·48	−0·65	−0·099	−0·19
31	M	11 34 27	17 0·80	21 57 52·00	− 93	−0·95	6	8·57	0·661	+0·046	42·44	+0·04	+0·066	+0·50
Nov. 1	C	11 29 43	16 12·47	49 25·43	+ 43	−1·08	(3, 2)	8·55	12·529	−0·016	16·29	−0·49	−0·009	−0·06
2	M	11 24 59	15 24·72	40 50·67	+ 33	−1·71	6	8·53	24·759	−0·006	41·89	−1·46	−0·015	−1·09
5	C	11 10 52	13 4·86	14 26·35	+ 117	−0·41	4	8·47	4·798	+0·179	16·65	+0·82	+0·128	+0·90
6	M	11 6 11	12 19·78	5 26·95	− 108	−0·71	(2)	8·44	19·644	+0·028	18·93	−1·13	−0·027	−1·12
7	C	11 1 31	11 35·42	20 56 25·75	− 8	−1·12	5	8·41	35·424	−0·012	16·28	−0·06	−0·062	−0·09
12	M	10 38 28	8 11·89	10 47·39	− 18	−1·17	5	8·23	11·785	+0·087	37·56	+0·43	+0·076	−0·59
13	C	10 33 56	7 35·29	1 41·17	− 38	−1·08	4	8·19	35·159	+0·093	30·78	+1·12	+0·090	+1·34
14	M	10 29 25	7 0·23	19 52 37·55	− 37	−1·21	(1)	8·15	0·083	+0·110	26·35	+1·84	+0·112	+2·12
17	C	10 16 2	5 24·86	25 42·88	− 54	−0·74	(1)	8·01	24·830	−0·024	34·71	−0·58	−0·012	−0·18
19	C	10 7 16	4 30·24[1]	8 14·45	+ 66	−1·45	5	7·91	30·227	+0·079	5·86	−0·77	+0·096	−0·32
20	M	10 2 56	4 5·77	18 59 39·95	+ 2	−1·06	5	7·86	5·753	+0·019	31·26	−0·23	+0·038	+0·24
23	C	9 50 7	3 4·18	34 41·97	− 7	−0·77	4	7·69	4·175	−0·002	34·31	−0·80	+0·021	−0·29
24[2]	M	9 45 54	2 47·78	26 42·17	+ 24	−1·03	5	7·64	47·730	+0·074	33·28	+0·22	+0·097	+0·73
27	M	9 33 30	2 11·09	3 37·20	− 108	−1·13	5	7·47	11·008	−0·026	29·22	−0·62	−0·010	−0·10
29	M	9 25 24	1 57·40	17 49 10·29	+ 27	−1·46	4	7·35	57·341	+0·086	2·09	−0·61	+0·092	−0·11
30	C	9 21 25	1 53·88	42 14·17	− 47	−1·00	4	7·29	53·809	+0·024	6·32	−0·44	+0·024	+0·04
Dec. 3	M	9 9 40	1 56·67	22 42·92	− 180	−0·79	5	7·12	56·615	−0·125	34·99	+0·02	−0·132	+0·41
5[2]	M	9 2 1	2 9·76	10 47·52	+ 78	−1·25	4	7·00	9·725	+0·113	40·58	−1·31	+0·116	−1·00
6[2]	C	8 58 15	2 19·48	5 10·00	+ 80	−0·92	...	6·94	19·658	−0·098	4·05	−1·91	−0·099	−1·63
7[2]	M	8 54 32	2 31·98	16 59 49·03	− 78	−0·30	5	6·88	31·831	+0·071	41·55	+0·30	+0·069	+0·55
8	C	8 50 50	2 46·30	54 40·87	+ 110	−1·18	5	6·80	46·234	+0·176	33·27	−0·38	+0·183	−0·16
10	C	8 43 34	3 21·74	45 7·06	+ 18	−0·65	(3)	6·70	21·669	+0·089	59·52	+0·18	+0·110	+0·35
11[2]	M	8 39 59	3 42·71	40 41·03	+ 71	−0·44	(2)	6·65	42·656	+0·125	34·18	−0·24	+0·154	−0·10
13[2]	M	8 32 55	4 30·97[3]	32 31·47	+ 149	−0·65	(1)	6·53	31·082	+0·037	26·43	−2·14	+0·071	−2·03
14	C	8 29 27	4 58·65	28 51·13	− 58	−1·43	4	6·48	58·472	+0·120	44·01	−0·79	+0·153	−0·71

[1] 2 wires. [2] Plain eye-piece. [3] 3 wires.

A correction = + 0ˢ·106 is included in the "Total Reduction" for the six observations in which the reversing eye-piece was not used on account of faintness of the planet through cloud or mist.

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Dublin.

1888–9	Observed Place		Total Reduction			Par.	R.A. Eph. L_3	Red. α — Eph.	Dec. Eph. L_3	Red. δ — Eph.	v'	
	h m s	° ′ ″	s	″		+ ″	s	s	″	″	s	″
Sept. 7[1]	2 29 47·89	+23 27 50·9	—0·060	—1·67	5	3·87	47·919	—0·089	55·05	—1·95		
12	32 34·65	23 49 55·2	— 53	—1·03	5	3·98	34·623	—0·026	59·50	—1·35	—0·018	—0·73
16	34 12·35	24 3 53·4	— 65	—1·07	6	4·08	12·291	—0·006	57·43	—1·02	—0·006	—0·52
26[2]	35 47·89	24 22 46·2	+ 88	—0·22	3, 4	4·34	47·953	+0·025	51·69	—1·37	+0·030	—1·16
Oct. 1[1]	35 13·05	24 22 41·9	0	—1·23	5	4·49	13·203	—0·153	45·94	—0·78	—0·123	—0·70
3[3]	34 43·99	...	— 121	...	3	...	43·988	—0·119	...	...	—0·086	...
4	34 26·21	24 19 18·5	+ 1	—0·87	4	4·58	26·192	+0·019	22·42	—0·21	+0·051	—0·19
13	30 18·64	23 53 30·9	— 11	—0·95	5	4·87	18·601	+0·028	34·72	+0·10	+0·042	—0·02
14	29 42·50	23 49 11·3	+ 29	—0·53	5	4·90	42·483	+0·046	16·23	—0·56	+0·059	—0·68
20	25 37·76	23 17 33·7	+ 26	—0·34	5	5·08	37·806	—0·020	37·94	+0·50	—0·007	+0·60
22	24 7·72	23 4 54·5	— 62	—0·56	4	5·14	7·680	—0·022	59·26	—0·18	—0·006	—0·01
30	17 45·70	22 5 20·8	— 24	—0·67	5	5·35	45·695	—0·019	25·50	—0·02	+0·011	+0·44
Nov. 16[4]	5 52·90	...	— 30	...	(1)	...	52·729	+0·141	...	...	+0·150	...
20	4 4·09	18 58 49·8	+ 24	—0·26	4	5·54	4·137	—0·023	56·05	—0·97	—0·004	—0·50
25	2 32·47	18 18 3·6	— 36	—0·58	4	5·49	32·440	—0·006	9·17	—0·66	+0·015	—0·14
27	2 10·34	18 2 53·0	+ 51	—0·46	4	5·46	10·392	—0·001	58·56	—0·56	+0·014	—0·04
30	1 53·65	17 51 31·3	— 52	+0·18	4	5·41	53·647	—0·049	38·12	—1·23	—0·049	—0·75
Dec. 8	2 47·36	16 54 8·1	— 62	—0·77	3	5·21	47·309	—0·011	12·54	0·00	—0·004	+0·22
9	3 3·94	16 49 14·0	+ 77	—0·39	4	5·19	4·078	—0·061	19·51	—0·71	—0·048	—0·52
11	3 44·19	16 40 10·1	+ 12	+0·20	5	5·12	44·183	+0·019	16·42	—1·00	+0·048	—0·86
26	13 5·74	16 1 59·7	— 21	—0·35	5	4·61	5·711	+0·008	4·59	—0·63	—0·012	—0·43
27	13 58·25	16 1 12·8	— 1	+0·11	4	4·58	58·254	—0·005	17·16	+0·33	—0·022	+0·55
28	14 52·66	16 0 38·0	— 33	—0·52	5	4·54	52·543	+0·084	41·89	+0·13	+0·070	+0·37
29	15 48·54	16 0 14·3	+ 7	—0·15	5	4·50	48·554	—0·007	18·60	+0·05	—0·017	+0·31
30	16 46·29	16 0 2·5	+ 23	+0·07	5	4·47	46·268	+0·045	7·06	—0·02	+0·038	+0·26
Jan. 10	29 5·59	16 9 45·1	— 86	+0·08	4	4·06	5·539	—0·035	48·92	+0·32		

[1] Ill defined. [2] Through cloud ; 5 wires. [3] Through cloud ; 2 wires.
[4] Scarcely visible ; 3 wires. (App. mag. assumed 9·5 in reduction.)

Greenwich.

1889	Obs.	Obs. R.A.	Geoc. Dec. from obs.	Total Reduction			(Par.)	R.A. Eph. L_3	Red. α — Eph.	Dec. Eph. L_3	Red. δ — Eph.	v'	
		h m s	° ′ ″	s	″		+ ″	s	s	″	″	s	″
Oct. 13	EP	2 30 19·19	+23 53 38·89	+0·051	+0·26	(2)	4·57	19·224	+0·017	39·13	+0·02	+0·031	—0·10
15	H	29 5·45	23 44 45·55	+ 3	+0·40	3	4·63	5·565	—0·112	45·82	+0·13	—0·100	+0·03
17	F	27 46·37	23 34 46·42	+ 42	+0·35	5	4·69	46·381	+0·031	45·94	+0·83	+0·042	+0·80
19	RW	26 22·22	23 23 39·27	— 23	+0·79	3, (2)	4·75	22·251	—0·054	40·61	—0·55	—0·042	—0·49
23	H	23 22·26	22 58 25·17	+ 10	—0·85	5	4·87	22·277	—0·007	25·13	—0·81	+0·010	—0·59
26	RP	21 0·04	22 36 58·08	0	+1·00	5	4·95	0·127	—0·087	59·52	—0·44	—0·057	—0·11
27	SD	20 11·92	22 29 24·60	— 21	+0·03	4	4·98	11·941	—0·042	25·31	—0·68	—0·005	+0·31
30	T	17 46·57	22 5 33·52	— 35	—0·43	(2)	5·05	46·546	—0·011	34·38	—1·29	+0·019	—0·83
Nov. 13	H	7 33·33	21 1 3·56	— 21	+0·47	(1)	5·26	33·321	—0·012	2·78	+1·25	—0·015	+1·48

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1889	Obs.	Obs. R.A.	Geoc. Dec. from obs.	Total Reduction			(Par.)	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ — Eph.	v'	
		h m s	° ′ ″	s	″		″	s	s	″	″	s	″
Nov. 17	H	...	+19 25 6·51	...	+1·10	4	5·28	...	...	7·49	+0·12	...	+0·52
20	RP	2 4 4·64	18 59 4·82	−0·077	−0·27	6	5·27	4·549	+0·014	5·04	−0·49	+0·033	−0·02
21	H	3 42·00	18 50 37·52	− 7	+0·30	3	5·26	42·124	−0·131	38·22	−0·40	−0·110	+0·09
26	F	2 20·42	18 10 35·71	+ 23	+0·17	5	5·22	20·536	−0·093	36·54	−0·66	−0·074	−0·14
27	T	2 10·57	18 3 5·12	− 70	+1·83	5	5·20	10·548	−0·048	6·38	+0·57	−0·033	+1·09
28	L	2 2·92	17 55 46·86	− 25	+0·31		5·19	2·732	+0·163	47·63	−0·46	+0·174	+0·04
Dec. 5	H	2 10·19	17 10 22·99	− 73	−0·31	5	5·05	10·181	−0·064	22·96	−0·28	−0·067	+0·03
6	T	2 20·34	17 4 47·67	− 93	−0·24	7	5·03	20·228	+0·019	47·14	+0·29	+0·018	+0·56
7	L	2 32·46	16 59 26·12	+ 5	+0·61	7	5·00	32·516	−0·051	25·39	+1·34	−0·049	+1·58

Leiden.

1888	Obs.	Observed Place		Total Reduction			Par.	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ — Eph.	v'	
		h m s	° ′ ″	s	″		+ ″	s	s	″	″	s	″
Sept. 21	W	2 35 26·960	+24 16 17·71	−0·009	−0·05	9	4·04	27·026	−0·075	21·57	+0·13	−0·078	+0·48
22	B	35 35·654	24 18 5·82	− 15	−0·53	9	4·07	35·628	+0·011	9·23	+0·13	+0·007	+0·45
25	W	35 48·221	24 21 58·84	+ 4	−0·37	9	4·15	48·227	−0·002	3·10	−0·48	0·000	−0·24
27	W	35 45·509	24 23 17·72	0	−0·35	8	4·20	45·540	−0·031	22·19	−0·62	−0·023	−0·44
Oct. 1	W	35 13·521	24 22 42·65	− 15	−0·65	11	4·31	13·577	−0·071	47·21	−0·90	−0·041	−0·82
18	B	27 5·400	23 29 20·42	− 18	−0·47	9	4·83	5·394	−0·012	25·30	−0·52	−0·001	−0·50
19	W	26 22·796	23 23 39·72	− 25	−0·14	8	4·86	22·787	−0·016	44·95	−0·51	−0·004	−0·45
24	B	22 35·948	22 51 30·76	− 23	−0·41		5·00	35·990	−0·065	35·21	+0·14	−0·045	+0·39
27	B	20 12·557	22 29 25·12	− 31	−0·06	8	5·09	12·544	−0·018	31·05	−0·90	+0·019	−0·53
Nov. 9	W	10 8·616	20 37 37·15	− 17	−0·41		5·18	8·593	+0·006	41·92	0·00	−0·034	−0·02
10	W	9 27·881	20 28 28·44	− 17	−0·41		5·34	27·829	+0·035	33·30	+0·07	+0·003	+0·09
Dec. 7	W	2 32·382	16 59 23·88	− 15	−0·41		5·09	32·349	+0·018	29·31	−0·75	+0·020	−0·51

Leipzig.

1888	Obs. R.A.	No. wires	Obs. Dec.	Total Reduction			Par.	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ — Eph.	v'	
	h m s		° ′ ″	s	″		+ ″	s	s	″	″	s	″
Sept. 20	2 35 16·15	10	+24 14 13·92	−0·093	+0·09	7	3·91	15·981	+0·076	16·63	+1·29	+0·073	+1·66
21	35 26·89	10	24 16 15·49	− 73	−0·34	7	3·93	26·812	+0·005	19·05	+0·03	+0·002	+0·38
22	35 35·59	11	24 18 2·59	− 58	−0·44	9	3·96	35·463	+0·069	7·01	−0·90	+0·067	−0·58
26	35 48·16	10	24 22 45·50	− 54	+0·05	9	4·06	48·022	+0·084	49·63	−0·02	+0·089	+0·19
27	35 45·69	13	24 23 17·66	− 127	−0·25	9	4·08	45·618	−0·055	21·66	−0·17	−0·047	+0·01
30	35 25·12	12	24 23 17·63	− 87	−0·03	8	4·17	25·095	−0·062	21·21	+0·56	−0·038	+0·67
Oct. 1	35 13·92	8	24 22 45·10	− 72	−0·85	8	4·19	13·847	+0·001	48·12	+0·32	+0·031	+0·40
3	34 44·94	4	24 20 47·33	− 117	−0·15	9	4·25	44·854	−0·031	51·31	+0·12	+0·002	+0·16
5	34 7·45	5	24 17 42·85	− 11	−0·24	10	4·31	7·400	+0·039	45·91	+1·01	+0·069	+1·01
7	33 21·89	7	24 13 27·14	− 48	−0·27	8	4·37	21·792	+0·050	30·97	+0·27	+0·076	+0·22
19	26 23·77	15	23 23 47·79*	− 40	−1·09	10	4·73	23·739	−0·009	52·64	−1·21	+0·003	−1·15

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1888	Obs. R.A.	No. wires	Obs. Dec.	Total Reduction			Par.	R.A. Eph. L_3	Red. α — Eph.	Dec Eph L_3	Red. δ — Eph.	v'	
	h m s		° ′ ″	s	″		″	s	s	″	″	s	″
Oct. 24	2 22 37·14	15	+22 51 39·59*	—0·031	—0·71	12	4·88	37·025	+0·084	44·47	—0·71	+0·104	—0·46
25	21 49·59	16	22 44 31·77*	— 22	—0·89	12	4·90	49·634	—0·066	36·23	—0·45	—0·042	—0·16
28	19 25·26	6	22 21 50·23	— 89	0·00	10	4·98	25·210	—0·039	55·49	—0·28	0·000	+0·12
31	16 59·88	9	21 57 28·12	— 52	+0·04	8	5·05	59·846	—0·018	33·93	—0·72	+0·002	—0·26
Nov. 1	16 11·79	15	21 49 2·40*	— 18	—0·44	12	5·07	11·725	+0·047	7·72	—0·69	+0·054	—0·26
5	13 4·17	10	21 14 2·95*	— 64	+0·13	12	5·15	4·028	+0·078	8·65	—0·42	+0·129	—0·34
8	10 51·55	15	20 46 57·06*	+ 36	—0·24	15	5·19	51·524	+0·062	1·50	+0·51	+0·110	+0·47
9	10 9·59	14	20 37 48·43*	— 93	—0·78	3	5·21	9·502	—0·005	53·96	—1·10	+0·036	—1·12
10	9 28·91	13	20 28 40·92	— 118	—0·05	5	5·22	28·711	+0·081	45·35	+0·74	+0·113	+0·76
11	8 49·53	9	20 19 30·48*	— 101	—0·28	(1)	5·23	49·231	+0·198	36·52	—1·09	+0·231	—1·01
12	8 11·35	12	20 10 22·36*	— 58	+0·09	(1)	5·24	11·154	+0·138	28·30	—0·61	+0·149	—0·45
14	6 59·54	15	19 52 11·57*	— 64	—0·35	(1)	5·25	59·504	—0·028	17·17	—0·70	—0·026	—0·42
16[1]	5 54·06	5	19 34 11·79	— 73	—0·29		5·25	54·333	—0·346	18·50	—1·75	—0·337	—1·38
17[2]	5 24·44	7	19 25 20·25	— 52	—0·29		5·26	24·337	+0·051	25·74	—0·52	+0·063	—0·12
20	4 5·39	8	18 59 17·11	— 28	—0·11	(1)	5·25	5·355	+0·007	22·62	—0·37	+0·026	+0·10
26	2 20·95	14	18 10 47·92*	— 54	—0·29		5·20	20·997	—0·101	55·43	—2·60	—0·082	—2·08
29	1 57·37	14	17 48 48·75	— 70	+0·13	9	5·15	57·264	+0·036	54·95	—0·92	+0·042	—0·42
30	1 53·92	16	17 41 54·51*	— 10	—0·09	3	5·13	53·769	+0·141	59·40	+0·15	+0·141	+0·63
Dec. 4	2 2·14	16	17 16 20·41*	— 55	—0·29		5·05	2·155	—0·070	24·92	+0·25	—0·075	+0·60
5	2 9·90	16	17 10 30·26*	— 55	—0·29		5·03	9·876	—0·031	34·77	+0·23	—0·034	+0·54
6	2 19·91	7	17 4 53·53	— 58	—0·31	(1)	5·01	19·845	+0·007	58·48	—0·25	+0·006	+0·03
7	2 32·10	13	16 59 30·45*	— 56	—0·29		4·98	32·055	—0·011	36·23	—1·09	—0·009	—0·84
8	2 46·58	16	16 54 23·57*	— 56	—0·29		4·96	46·497	+0·027	28·19	+0·05	+0·034	+0·27
10	3 21·96	15	16 44 50·42*	— 56	—0·29		4·90	22·002	—0·098	54·94	+0·09	—0·077	+0·26
13	4 31·53	15	16 32 17·82*	— 18	—0·14	(1)	4·82	31·527	—0·015	22·55	—0·05	+0·019	+0·05
14	4 58·95	14	16 28 36·03*	— 57	—0·29		4·79	58·952	—0·059	40·38	+0·15	—0·026	+0·23
19	7 46·82	14	16 13 36·58*	— 48	—0·37	(1)	4·62	46·812	—0·040	40·68	+0·15	—0·059	+0·12
21	9 7·93	16	16 9 12·84*	— 59	—0·29		4·56	7·802	+0·069	17·01	+0·10	+0·039	+0·03

* Double pointings for Dec. of planet.
[1] Very uncertain; clouds. [2] Very faint. (Assumed app. mag. 9 in reduction.)

Melbourne.

1888	Obs.	Observed Place		Est. Wt.*	Total Reduction			Par.	R.A. Eph. L_3	Red. α — Eph.	Dec. Eph. L_3	Red. δ —Eph.	v'	
		h m s	° ′ ″		s	″		— ″	s	s	″	″	s	″
Nov. 13	S	2 7 47·774	+20 4 53·56	1	+0·061	—1·40	1	8·68	47·851	—0·016	42·65	+0·83	—0·022	+1·03
16	S	6 5·784	19 37 44·81	4	— 9	—1·68	5, 4	8·46	5·821	—0·046	35·86	—1·19	—0·039	—0·84
20	P	4 14·009	19 2 39·82	5	+ 109	—0·66	9	8·26	14·132	—0·014	31·25	—0·35	+0·004	+0·12
22	S	3 29·658	18 45 48·27	4	— 4	—0·63	5, 4	8·15	29·675	—0·021	39·29	+0·20	+0·001	+0·70
26	P	2 24·995	18 13 49·80	5, 6	+ 85	—1·17	3	7·93	25·147	—0·067	40·85	—0·15	—0·047	+0·37
30	S	...	17 44 38·15	4	...	—1·02	5	7·69	...	...	30·99	—1·55	...	—1·06
Dec. 3	P	1 55·253	17 24 53·54	5	+ 21	—1·40	4	7·51	55·242	+0·032	46·12	—1·49	+0·025	—1·09
7	P	2 27·246	17 1 41·01	6	— 3	—1·17	3	7·27	27·292	—0·049	33·23	—0·66	—0·048	—0·40

* Weight estimated on a scale 1...10. Nov. 13 faint; cloudy (app. mag. assumed 9 in reduction).

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Oxford (Radcliffe Obs.).

1888	Obs.	Observed Place		Total Reduction			Par.	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ —Eph.	v'	
		h m s	° ′ ″	s	″		+ ″	s	s	″	″	s	″
Oct. 15	R	2 29 5·35	+23 44 42·22	—0·010	—0·68	(1)	4·68	5·431	—0·091	44·84	+1·38	—0·079	+1·28
17	R	27 46·22	23 34 40·54	— 35	—0·44	(–, 2)	4·74	46·218	—0·033	44·61	+0·23	—0·022	+0·20
19	R	26 22·16	23 23 36·24	— 43	—0·74	(3)	4·80	22·106	+0·011	39·39	+0·91	+0·023	+0·97
20	FB	25 38·46	23 17 40·93	— 47	—1·65	(1, 2)	4·83	38·429	—0·016	43·08	+1·03	—0·003	+1·13
22	R	24 8·30	23 5 2·12	— 30	—1·29	(1)	4·89	8·340	—0·070	4·80	+0·92	—0·054	+1·09
23	FB	23 22·06	22 58 21·12	— 35	—1·49	(2)	4·92	22·114	—0·089	23·68	+0·87	—0·071	+1·09
30	FB	17 46·35	22 5 28·97	— 38	—1·22	(2)	5·10	46·378	—0·066	32·47	+0·38	—0·036	+0·84
Nov. 13	FB	7 33·21	20 0 55·53	— 62	—0·05	4	5·31	33·195	—0·047	0·86	—0·07	—0·050	+0·16
16	FB	5 53·22	19 33 53·13	— 27	—0·90	(2, 3)	5·32	53·164	+0·029	58·23	—0·68	+0·038	—0·31
17	R	5 23·28	19 25 0·34:	— 35	—0·57	(–, 1)	5·32	23·235	+0·010	5·64	—0·55:	+0·022	—0·16
21	R	3 42·12	18 50 31·19	— 58	—0·54	(2)	5·31	42·032	+0·030	36·46	—0·50	+0·051	—0·01
22	FB	3 21·61	18 42 11·65	— 45	—0·13	6	5·30	21·622	—0·057	17·73	—0·91	—0·034	—0·41
26	R	2 20·48	18 10 30·19	— 17	—0·61	(1)	5·28	20·497	—0·034	34·94	—0·08	—0·015	+0·44
27	FB	2 10·56	18 3 0·93	— 29	—2·20	5	5·24	10·517	+0·014	4·83	—0·86	+0·029	—0·34
30	R	1 53·42	17 41 38·08	— 25	—0·59	(2)	5·19	53·679	—0·284	43·90	—1·22	—0·284	—0·74
Dec. 1	FB	1 52·35	17 34 56·34	— 35	—1·33	(1)	5·17	52·494	—0·179	1·24	—1·06	—0·184	—0·62
6	FB	2 20·39	17 4 43·85	— 46	—1·85	(2, 3)	5·06	20·257	+0·087	46·00	+1·06	+0·086	+1·33
12	R	4 7·19	16 36 7·08	— 76	—1·82	4	4·90	7·134	—0·020	9·79	+0·37	+0·013	+0·49

Pulkowa.

1888	M.T.P.	Observed Place		Total Reduction			Par.	R.A. Eph. L_2	Red. α — Eph.	Dec. Eph. L_2	Red. δ —Eph.	v'	
	h m s	h m s	° ′ ″	s	″		+ ″	s	s	″	″	s	″
Sept. 22	14 26 26	2 35 35·31	+24 17 56·52	—0·074	+0·28	3	5·06	35·085	+0·151	1·99	—0·13	+0·149	+0·19
25	14 52	35 48·20	24 21 54·63	— 4	—0·44	6	5·16	48·160	+0·036	59·10	+0·25	+0·038	+0·49
27	6 57	35 45·80	24 23 15·18	+ 92	—0·06	6	5·23	45·789	+0·103	20·44	—0·09	+0·111	+0·10
28	2 57	35 41·30	24 23 31·33	— 16	+0·75	6	5·26	41·276	+0·008	37·34	0·00	+0·120	+0·17
30	13 54 50	35 25·56	24 23 17·86	+ 49	—0·80	6	5·33	25·597	+0·012	22·42	—0·03	+0·036	+0·09
Oct. 2	46 33	35 1·21	24 21 56·45	— 24	—0·12	6	5·40	1·144	+0·042	1·09	+0·64	+0·075	+0·70
4	38 8	34 28·05	24 19 25·50	— 4	+0·56	6	5·47	28·099	—0·053	31·85	—0·32	—0·020	—0·30
5	33 53	34 8·38	24 17 45·42	+ 39	—0·36	4	5·51	8·433	—0·014	51·47	—0·90	+0·017	—0·90
6	29 35	33 46·66	24 15 47·78	— 21	—0·43	6	5·55	46·726	—0·087	53·50	—0·60	—0·059	—0·62
7	25 16	33 23·02	24 13 32·64	— 39	—0·23	6	5·58	23·024	—0·043	38·17	—0·18	—0·017	—0·22
8	20 54	32 57·38	24 11 0·00	— 43	—0·14	6	5·58	57·384	—0·047	5·37	+0·07	—0·023	+0·01
9	16 31	32 29·73	24 8 7·28	— 28	+0·84	6	5·65	29·859	—0·157	15·07	—1·30	—0·135	—1·38
11	7 39	31 29·42	24 1 36·87	+ 20	—0·29	6	5·72	29·405	+0·035	42·18	+0·12	+0·052	+0·01
27	11 53 33	20 15·97	22 29 57·81	— 57	+0·11	6	6·23	16·010	—0·097	4·03	+0·12	—0·061	+0·49
Nov. 1	29 52	16 14·16	21 49 26·58	— 6	+0·31	6	6·34	14·110	+0·044	33·08	+0·15	+0·051	+0·58
2	25 8	15 26·27	21 40 52·20	+ 106	—0·60	6	6·36	26·324	+0·052	58·94	—0·98	+0·044	—0·61
3	20 25	14 38·90	21 32 10·07	— 26	—0·09	7	6·38	39·017	—0·143	17·36	—1·00	—0·169	—0·71
Dec. 4	9 5 57	2 1·63	17 16 37·63	+ 59	+0·77	3	6·11	1·830	—0·141	42·72	+1·79	—0·146	+2·14
8	8 50 57	2 45·55	16 54 38·60	+ 13	+0·84	7, 8	5·97	45·725	—0·162	43·19	+2·22	—0·156	+2·44
12	36 33	4 4·84	16 36 24·63	— 34	+1·62	(2)	5·83	5·006	—0·200	31·19	+0·89	—0·168	+1·01

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1888	M.T.P.	Observed Place	Total Reduction	Par.	R.A. Eph.L_3	Red. α —Eph.	Dec. Eph.L_3	Red. δ —Eph.	v'	
	h m s	h m s ° ′ ″	s ″	″	s	s	″	″	s	″
Dec. 15	8 26 6	2 5 26·86 +16 25 17·36	+0·078 —0·26 9	5·71	26·944	—0·006	22·47	+0·34	+0·024	+0·40
17	19 20	6 31·96 16 19 4·55	+ 15 —0·04 6, 5	5·63	31·909	+0·066	7·39	+2·75	+0·074	+2·76
18	15 59	7 7·49 16 16 15·94	— 18 —0·73 10	5·60	7·411	+0·061	20·79	+0·02	+0·054	+0·01

Observations made by eye and ear, transits over 7 wires. Declination October 9 estimated 1″ too south (corr. + 1″ is contained in the reduction).

December 17, star **a**′ was excluded from the determination of the day correction for Declination. The values of the corrections for this day, however, are discordant altogether, the separate stars giving $\Delta\alpha$ for $8^{m}\cdot0$ and $\Delta\delta$:

	s	″
a′	— 0·10	+ 5·64
b	+ 0·05	+ 1·88
c	— 0·07	— 0·66
n	+ 0·02	— 2·25
v	+ 0·06	— 1·54
z	+ 0·11	+ 2·39

The values, Reduced R.A. and Dec. — Ephemeris L_3, of the preceding tables ($=\Delta\alpha$ and $\Delta\delta$), are arranged chronologically in the following table, and weights (p) are placed against them, taken from the general table of weights, Vol. II., p. 702–3, with regard to the number of stars observed, diminishing them however to $\frac{3}{4}$ or $\frac{1}{2}$ their amount, when no comparison stars, or not a sufficient number of them, were observed. An oversight was made in the use of the general table of weights here, as well as in the reduction of the *Victoria* and *Sappho* observations, viz., taking out throughout only the weight assigned in the table to the result of one observation $= p_1$, and putting the weight of the planet's reduced place $=p_1 \frac{n}{n+1}$, n being the number of comparison stars observed. The true weight should have been somewhere between this and another weight $=\frac{p_1 p_n}{p_1+p_n}$, where p_n is the weight given in the general table for a mean from n observations, or the latter itself, if the "constant" error in an observation of the planet is assumed to be entirely independent from the constant part of error, allowed for in the general determination of weights, which remains in the same day's star-observations. This oversight however has not been of any practical importance, making the assumed weights generally a trifle too high, but changing the proportions to an extent only which, even numerically, remains insensible in most cases, at least for the Declinations, for which alone it otherwise would not be entirely indifferent to deal with the matter.

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Chronological Table of Differences, Obs.–Eph.

Epoch M. T. B.		Obs.	Δα	p	v	Δδ N. Obs.	Δδ S. Obs.	p	v
			s		s	″	″		″
September	7·69	D	— 0·089	0·3		— 1·95		0·2	
	12·68	D	— 0·026	0·3		— 1·35		0·2	
	16·67	D	— 0·006	0·3		— 1·02		0·2	
	20·60	Lz	+ 0·076	0·6		+ 1·29		0·2	
	21·60	Lz	+ 0·005	0·6		+ 0·03		0·2	
	62	Ld	— 75	1·2		+ 0·13		0·4	
	22·55	Pu	+ 0·151	0·1		— 0·13		0·1	
	60	Lz	+ 69	0·6		— 0·90		0·2	
	62	Ld	+ 11	1·2		+ 0·13		0·4	
	25·54	Pu	+ 0·036	0·2		+ 0·25		0·1	
	61	Ld	— 2	1·2		— 0·48		0·4	
	26·59	Lz	+ 0·084	0·6		— 0·02		0·2	
	64	D	+ 25	0·3		— 1·37		0·2	
	27·54	Pu	+ 0·103	0·2		— 0·09		0·1	
	59	Lz	— 55	0·6		— 0·17		0·2	
	61	Ld	— 31	1·2		— 0·62		0·4	
	28·53	Pu	+ 0·008	0·2		0·00		0·1	
	30·53	Pu	+ 0·012	0·2		— 0·03		0·1	+ 0·29
	58	Lz	— 62	0·6		+ 0·56		0·2	+ 0·88
October	1·57	Lz	+ 0·001	0·6		+ 0·32		0·2	+ 0·61
	60	Ld	— 71	1·2		— 0·90		0·5	— 0·61
	63	D	— 153	0·3		— 0·78		0·2	— 0·49
	2·52	Pu	+ 0·042	0·2		+ 0·64		0·1	+ 0·89
	3·57	Lz	— 0·031	0·3		+ 0·12		0·2	+ 0·34
	62	D	— 119	0·1		...		...	...
	4·52	Pu	— 0·053	0·2	— 0·017	— 0·32		0·1	— 0·15
	62	D	+ 19	0·3	+ 54	— 0·21		0·2	— 0·04
	5·51	Pu	— 0·014	0·2	+ 11	— 0·90		0·1	— 0·79
	56	Lz	+ 39	0·3	+ 63	+ 1·01		0·2	+ 1·12
	6·51	Pu	— 0·087	0·2	— 72	— 0·60		0·1	— 0·57
	7·51	Pu	— 0·043	0·2	— 38	— 0·18		0·1	— 0·23
	56	Lz	+ 50	0·4	+ 54	+ 0·27		0·2	+ 0·22
	8·50	Pu	— 0·047	0·2	— 52	+ 0·07		0·1	— 0·08
	9·50	Pu	— 0·157	0·2	— 169	— 1·30		0·1	— 1·54
	11·49	Pu	+ 0·035	0·2	+ 19	+ 0·12		0·1	— 0·16
	13·57	Gr	+ 0·017	0·3	+ 25	+ 0·02		0·1	— 0·16
	59	D	+ 28	0·3	+ 36	+ 0·10		0·2	— 0·08
	14·59	D	+ 0·046	0·3	+ 73	— 0·56		0·2	— 0·70
	15·52	Cp	— 0·007	0·1	+ 23		+ 0·77	0·2	+ 0·66
	57	Gr	— 112	0·3	— 82	+ 0·13		0·2	+ 0·02
	57	O	— 91	0·2	— 61	+ 1·38		0·2	+ 1·27
	16·51	Cp	+ 0·022	0·1	+ 55		— 0·54	0·2	— 0·58
	17·56	Gr	+ 0·031	0·3	+ 75	+ 0·83		0·2	+ 0·89
	56	O	— 33	0·1	+ 11	+ 0·23		0·2	+ 0·29
	18·54	Ld	— 0·012	1·2	+ 37	— 0·52		0·4	— 0·36

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Epoch M. T. B.		Obs.	Δα	p	v	Δδ N. Obs.	Δδ S. Obs.	Δδ p	Δδ v
			s		s	″	″		″
October	19·52	B	− 0·007	1·6	+ 0·038	− 0·01		0·8	+ 0·19
	52	Lz	− 9	0·6	+ 36	− 1·21		0·4	− 1·01
	54	Ld	− 16	1·2	+ 29	− 0·51		0·4	− 0·31
	55	Gr	− 54	0·3	− 9	− 0·55		0·1	− 0·35
	56	O	+ 11	0·2	+ 56	+ 0·91		0·2	+ 1·11
	20·55	O	− 0·016	0·2	+ 22	+ 1·03		0·2	+ 1·26
	57	D	− 20	0·3	+ 18	+ 0·50		0·2	+ 0·73
	22·49	Cp	+ 0·104	0·1	+ 132		+ 0·24	0·2	+ 0·45
	55	O	− 70	0·2	− 42	+ 0·92		0·2	+ 1·13
	56	D	− 22	0·3	+ 5	− 0·18		0·2	+ 0·03
	23·54	Gr	− 0·007	0·3	+ 11	− 0·81		0·2	− 0·67
	54	O	− 89	0·2	− 71	+ 0·87		0·2	+ 1·01
	24·50	B	− 0·014	1·6	− 4	− 0·56		0·8	− 0·51
	50	Lz	+ 84	0·6	+ 94	− 0·71		0·4	− 0·66
	52	Ld	− 65	0·7	− 55	+ 0·14		0·3	+ 0·19
	25·50	B	− 0·023	1·7	− 15	− 0·31		0·8	− 0·33
	50	Lz	− 66	0·6	− 58	− 0·45		0·4	− 0·47
	26·48	Cp	− 0·081	0·1	− 71		− 0·45	0·2	− 0·44
	53	Gr	− 87	0·3	− 77	− 0·44		0·2	− 0·43
	27·44	Pu	− 0·097	0·2	− 82	+ 0·12		0·1	+ 0·24
	52	Ld	− 18	1·2	− 3	− 0·90		0·4	− 0·78
	53	Gr	− 42	0·3	− 27	− 0·68		0·2	− 0·56
	28·49	B	− 0·036	1·6	− 13	− 0·33		0·8	− 0·17
	49	Lz	− 39	0·3	− 16	− 0·28		0·2	− 0·12
	29·47	Cp	+ 0·005	0·1	+ 37		+ 1·48	0·2	+ 1·59
	30·47	Cp	− 0·129	0·1	− 94		− 0·65	0·2	− 0·55
	52	Gr	− 11	0·2	+ 24	− 1·29		0·1	− 1·19
	52	O	− 66	0·2	− 31	+ 0·38		0·2	+ 0·48
	54	D	− 19	0·3	+ 16	− 0·02		0·2	+ 0·08
	31·46	Cp	+ 0·046	0·1	+ 72		+ 0·04	0·2	+ 0·18
	48	Lz	− 18	0·6	+ 8	− 0·72		0·2	− 0·58
November	1·43	Pu	+ 0·044	0·2	+ 57	+ 0·15		0·1	+ 0·34
	46	Cp	− 16	0·1	− 4		− 0·49	0·1	− 0·30
	48	Lz	+ 47	0·6	+ 59	− 0·69		0·4	− 0·50
	2·42	Pu	+ 0·052	0·2	+ 46	− 0·98		0·1	− 0·82
	46	Cp	− 6	0·1	− 13		− 1·46	0·2	− 1·30
	3·42	Pu	− 0·143	0·2	− 170	− 1·00		0·1	− 0·86
	5·45	Cp	+ 0·179	0·1	+ 136		+ 0·82	0·2	+ 0·88
	46	Lz	+ 78	0·6	+ 35	− 0·42		0·4	− 0·36
	6·44	Cp	+ 0·028	0·1	− 14		− 1·13	0·1	− 1·14
	7·44	Cp	− 0·012	0·1	− 51		− 0·06	0·2	− 0·13
	8·45	Lz	+ 0·062	0·6	+ 33	+ 0·51		0·4	+ 0·42
	9·45	B	− 0·006	1·7	− 25	− 0·41		0·8	− 0·43
	45	Lz	− 5	0·5	− 24	− 1·10		0·3	− 1·12
	47	Ld	+ 6	0·7	− 13	0·00		0·3	− 0·02
	10·45	Lz	+ 0·081	0·6	+ 67	+ 0·74		0·2	+ 1·02
	47	Ld	+ 35	0·7	+ 21	+ 0·07		0·3	+ 0·36
	11·44	B	− 0·005	1·6	− 16	− 0·49		0·8	− 0·32
	44	Lz	+ 198	0·3	+ 187	− 1·09		0·2	− 0·92

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Epoch M. T. B.		Obs.	Δα	p	v	Δδ N. Obs.	Δδ S. Obs.	Δδ p	Δδ v
			s		s	″	″		″
November	12·42	Cp	+ 0·087	0·1	+ 0·078		+ 0·43	0·2	+ 0·61
	44	B	+ 4	1·4	— 5	— 0·03		0·7	+ 0·15
	44	Lz	+ 138	0·3	+ 129	— 0·61		0·2	— 0·43
	13·07	M	— 0·016	0·1	— 17		+ 0·83	0·1	+ 1·03
	42	Cp	+ 93	0·1	+ 88		+ 1·12	0·2	+ 1·34
	47	Gr	— 12	0·1	— 7	+ 1·25		0·1	+ 1·47
	48	O	— 47	0·2	— 42	— 0·07		0·2	+ 0·15
	14·42	Cp	+ 0·110	0·1	+ 100		+ 1·84	0·1	+ 2·12
	43	B	— 32	1·4	— 42	— 0·44		0·7	— 0·16
	43	Lz	— 28	0·3	— 38	— 0·70		0·2	— 0·42
	16·06	M	— 0·046	0·2	— 52		— 1·19	0·2	— 0·80
	43	Lz	— 346	0·1	— 351	— 1·75		0·1	— 1·33
	47	O	+ 29	0·2	+ 24	— 0·68		0·2	— 0·26
	48	D	+ 141	0·1	+ 136	...		...	...
	17·41	Cp	— 0·024	0·1	— 25		— 0·58	0·1	— 0·16
	43	Lz	+ 51	0·1	+ 50	— 0·52		0·1	— 0·10
	46	Gr	...	...	...	+ 0·12		0·2	+ 0·54
	46	O	+ 10	0·1	+ 9	— 0·55 :		0·1	— 0·13
	19·40	Cp	+ 0·079	0·1	+ 78		— 0·77	0·2	— 0·25
	20·05	M	— 0·014	0·3	— 11		— 0·35	0·2	+ 0·20
	40	Cp	+ 19	0·1	+ 24		— 0·23	0·2	+ 0·33
	41	B	+ 21	1·5	+ 26	0·00		0·7	+ 0·57
	42	Lz	+ 7	0·3	+ 12	— 0·37		0·1	+ 0·20
	45	Gr	+ 14	0·3	+ 18	— 0·49		0·2	+ 0·08
	47	D	— 23	0·3	— 19	— 0·97		0·2	— 0·40
	21·45	Gr	— 0·131	0·3	— 135	— 0·40		0·2	+ 0·18
	45	O	+ 30	0·2	+ 26	— 0·50		0·2	+ 0·08
	22·04	M	— 0·021	0·2	— 27		+ 0·20	0·2	+ 0·79
	45	O	— 57	0·3	— 64	— 0·91		0·3	— 0·32
	23·39	Cp	— 0·002	0·1	— 7		— 0·80	0·2	— 0·19
	24·39	Cp	+ 0·074	0·1	+ 79		+ 0·22	0·2	+ 0·82
	25·45	D	— 0·006	0·3	+ 12	— 0·66		0·2	— 0·02
	26·03	M	— 0·067	0·3	— 45		— 0·15	0·2	+ 0·53
	39	Lz	— 101	0·3	— 77	— 2·60		0·2	— 1·89
	43	Gr	— 93	0·3	— 68	— 0·66		0·2	+ 0·05
	44	O	— 34	0·2	— 9	— 0·08		0·2	+ 0·64
	27·38	Cp	— 0·026	0·1	+ 2		— 0·62	0·2	+ 0·19
	43	Gr	— 48	0·3	— 20	+ 0·57		0·2	+ 1·38
	43	O	+ 14	0·2	+ 42	— 0·86		0·2	— 0·05
	45	D	— 1	0·3	+ 27	— 0·56		0·2	+ 0·26
	28·43	Gr	+ 0·163	0·2	+ 190	— 0·46		0·1	+ 0·40
	29·37	Cp	+ 0·086	0·1	+ 117		— 0·61	0·2	+ 0·22
	39	Lz	+ 36	0·7	+ 67	— 0·92		0·4	— 0·09
	30·02	M	...	...	...		— 1·55	0·2	— 0·73
	37	Cp	+ 0·024	0·1	+ 48		— 0·44	0·2	+ 0·38
	39	Lz	+ 141	0·5	+ 165	+ 0·15		0·3	+ 0·97
	42	O	— 284	0·2	— 260	— 1·22		0·2	— 0·40
	44	D	— 49	0·3	— 25	— 1·23		0·2	— 0·41

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Epoch M. T. B.		Obs.	Δα	p	v	Δδ N. Obs.	Δδ S. Obs.	p	v
			s		s	″	″		″
December	1·38	B	+ 0·027	1·6	+ 0·039	− 0·04		0·8	+ 0·71
	42	O	− 179	0·2	− 167	− 1·06		0·2	− 0·31
	3·01	M	+ 0·032	0·3	+ 36		− 1·49	0·2	− 0·88
	36	Cp	− 125	0·1	− 123		+ 0·02	0·2	+ 0·59
	4·33	Pu	− 0·141	0·1	− 147	+ 1·79		0·1	+ 2·20
	37	B	− 10	1·7	− 16	+ 0·35		0·8	+ 0·75
	38	Lz	− 70	0·3	− 76	+ 0·25		0·2	+ 0·65
	5·36	Cp	+ 0·113	0·1	+ 107		− 1·31	0·2	− 0·99
	37	B	− 13	1·3	− 19	− 0·29		0·6	+ 0·03
	37	Lz	− 31	0·3	− 37	+ 0·23		0·2	+ 0·55
	41	Gr	− 64	0·3	− 70	− 0·28		0·2	+ 0·04
	6·35	Cp	− 0·098	0·1	− 90		− 1·91	0·1	− 1·61
	37	Lz	+ 7	0·1	+ 15	− 0·25		0·1	+ 0·05
	41	Gr	+ 19	0·3	+ 27	+ 0·29		0·2	+ 0·59
	41	O	+ 87	0·2	+ 95	+ 1·06		0·2	+ 1·36
	7·00	M	− 0·049	0·3	− 32		− 0·66	0·2	− 0·35
	35	Cp	+ 71	0·1	+ 93		+ 0·30	0·2	+ 0·63
	37	B	+ 6	1·5	+ 28	− 0·04		0·7	+ 0·29
	37	Lz	− 11	0·3	+ 11	− 1·09		0·2	− 0·76
	39	Ld	+ 18	0·7	+ 40	− 0·75		0·3	− 0·42
	40	Gr	− 51	0·3	− 28	+ 1·34		0·2	+ 1·67
	8·32	Pu	− 0·162	0·2	− 127	+ 2·22		0·1	+ 2·58
	35	Cp	+ 176	0·1	+ 211		− 0·38	0·2	− 0·02
	36	B	+ 25	1·3	+ 60	+ 0·24		0·6	+ 0·60
	37	Lz	+ 27	0·3	+ 62	+ 0·05		0·2	+ 0·41
	42	D	− 11	0·3	+ 25	0·00		0·1	+ 0·36
	9·41	D	− 0·061	0·3	− 15	− 0·71		0·2	− 0·37
	10·34	Cp	+ 0·089	0·1	+ 141		+ 0·18	0·2	+ 0·51
	36	Lz	− 98	0·3	− 46	+ 0·09		0·2	+ 0·42
	11·34	Cp	+ 0·125	0·1	+ 169		− 0·24	0·1	+ 0·09
	41	D	+ 19	0·3	+ 62	− 1·00		0·2	− 0·67
	12·31	Pu	− 0·200	0·1	− 162	+ 0·89		0·1	+ 1·14
	39	O	− 20	0·2	+ 18	+ 0·37		0·2	+ 0·62
	13·34	Cp	+ 0·037	0·1	+ 71		− 2·14	0·1	− 2·00
	35	B	− 37	1·4	− 3	− 0·21		0·7	− 0·07
	35	Lz	− 15	0·3	+ 19	− 0·05		0·2	+ 0·09
	14·33	Cp	+ 0·120	0·1	+ 147		− 0·79	0·2	− 0·76
	35	Lz	− 59	0·3	− 32	+ 0·15		0·2	+ 0·18
	15·30	Pu	− 0·006	0·2	+ 15	+ 0·34		0·1	+ 0·26
	17·29	Pu	+ 0·066	0·2	+ 69	+ 2·75		0·1	+ 2·51
	18·29	Pu	+ 0·061	0·2	+ 53	+ 0·02		0·1	− 0·27
	19·34	Lz	− 0·040	0·3	− 58	+ 0·15		0·2	− 0·18
	21·33	Lz	+ 0·069	0·3		+ 0·10		0·2	
	26·37	D	+ 0·008	0·3		− 0·63		0·2	
	27·37	D	− 0·005	0·3		+ 0·33		0·2	
	28·37	D	+ 0·084	0·3		+ 0·13		0·2	
	29·37	D	− 0·007	0·3		+ 0·05		0·2	
	30·37	D	+ 0·045	0·3		− 0·02		0·2	
January	10·34	D	− 0·035	0·3		+ 0·32		0·2	

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The daily means of the corrections of the ephemeris are found from this table as follows :—

Daily Means of Observed Corrections to Ephemeris L_3.

Ep. R.A.	$\Delta\alpha$	p	Ep. Dec.	$\Delta\delta$	p	v		No. obs.
	s			″		s	″	
Sept. 7·69	− 0·089	0·3	Sept. 7·69	− 1·95	0·2			1
12·68	− 0·026	0·3	12·68	− 1·35	0·2			1
16·67	− 0·006	0·3	16·67	− 1·02	0·2			1
20·60	+ 0·076	0·6	20·60	+ 1·29	0·2			1
21·61	− 0·048	1·8	21·61	+ 0·10	0·6			2
22·61	+ 0·035	1·9	22·60	− 0·20	0·7			3
25·60	+ 0·003	1·4	25·60	− 0·33	0·5			2
26·61	+ 0·064	0·9	26·61	− 0·69	0·4			2
27·60	− 0·025	2·0	27·59	− 0·42	0·7			3
28·53	+ 0·008	0·2	28·53	0·00	0·1			1
30·57	− 0·043	0·8	30·56	+ 0·36	0·3		+ 0·68	2
Oct. 1·60	− 0·062	2·1	Oct. 1·60	− 0·60	0·9		− 0·31	3
2·52	+ 0·042	0·2	2·52	+ 0·64	0·1		+ 0·89	1
3·58	− 0·053	0·4	3·57	+ 0·12	0·2		+ 0·34	2, 1
4·58	− 0·010	0·5	4·59	− 0·25	0·3	+ 0·026	− 0·08	2
5·54	+ 0·018	0·5	5·54	+ 0·37	0·3	+ 0·042	+ 0·48	2
6·51	− 0·087	0·2	6·51	− 0·60	0·1	− 0·072	− 0·57	1
7·54	+ 0·019	0·6	7·54	+ 0·12	0·3	+ 0·023	+ 0·07	2
8·50	− 0·047	0·2	8·50	+ 0·07	0·1	− 0·052	− 0·08	1
9·50	− 0·157	0·2	9·50	− 1·30	0·1	− 0·169	− 1·54	1
11·49	+ 0·035	0·2	11·49	+ 0·12	0·1	+ 0·019	− 0·16	1
13·58	+ 0·022	0·6	13·58	+ 0·07	0·3	+ 0·030	− 0·11	2
14·59	+ 0·046	0·3	14·59	− 0·56	0·2	+ 0·073	− 0·70	1
15·56	− 0·087	0·6	15·55	+ 0·76	0·6	− 0·057	+ 0·65	3
16·51	+ 0·022	0·1	16·51	− 0·54	0·2	+ 0·055	− 0·58	1
17·56	+ 0·015	0·4	17·56	+ 0·53	0·4	+ 0·059	+ 0·59	2
18·54	− 0·012	1·2	18·54	− 0·52	0·4	+ 0·037	− 0·36	1
19·53	− 0·013	3·9	19·53	− 0·30	1·9	+ 0·032	− 0·10	5
20·56	− 0·018	0·5	20·56	+ 0·76	0·4	+ 0·020	+ 0·99	2
22·54	− 0·017	0·6	22·53	+ 0·33	0·6	+ 0·011	+ 0·54	3
23·54	− 0·040	0·5	23·54	+ 0·03	0·4	− 0·022	+ 0·17	2
24·50	− 0·006	2·9	24·50	− 0·46	1·5	+ 0·004	− 0·41	3
25·50	− 0·034	2·3	25·50	− 0·36	1·2	− 0·026	− 0·38	2
26·52	− 0·085	0·4	26·50	− 0·44	0·4	− 0·075	− 0·44	2
27·51	− 0·032	1·7	27·51	− 0·69	0·7	− 0·017	− 0·57	3
28·49	− 0·036	1·9	28·49	− 0·32	1·0	− 0·013	− 0·16	2
29·47	+ 0·005	0·1	29·47	+ 1·48	0·2	+ 0·037	+ 1·59	1
30·52	− 0·042	0·8	30·51	− 0·27	0·7	− 0·007	− 0·17	4
31·48	− 0·009	0·7	31·47	− 0·34	0·4	+ 0·017	− 0·20	2
Nov. 1·46	+ 0·039	0·9	Nov. 1·47	− 0·52	0·6	+ 0·052	− 0·33	3
2·43	+ 0·033	0·3	2·45	− 1·30	0·3	+ 0·026	− 1·14	2
3·42	− 0·143	0·2	3·42	− 1·00	0·1	− 0·170	− 0·86	1
5·46	+ 0·092	0·7	5·46	− 0·01	0·6	+ 0·049	+ 0·05	2

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Ep. R.A.	Δα	p	Ep. Dec.	Δδ	p	v		No. obs.
	s			″		s		
Nov. 6·44	+ 0·028	0·1	Nov. 6·44	− 1·13	0·1	− 0·014	− 1·14	1
7·44	− 0·012	0·1	7·44	− 0·06	0·2	− 0·051	− 0·13	1
8·45	+ 0·062	0·6	8·45	+ 0·51	0·4	+ 0·033	+ 0·42	1
9·45	− 0·003	2·9	9·45	− 0·47	1·4	− 0·022	− 0·49	3
10·46	+ 0·056	1·3	10·46	+ 0·34	0·5	+ 0·042	+ 0·62	2
11·44	+ 0·027	1·9	11·44	− 0·61	1·0	+ 0·016	− 0·44	2
12·44	+ 0·031	1·8	12·44	− 0·05	1·1	+ 0·022	+ 0·13	3
13·38	− 0·006	0·5	13·39	+ 0·70	0·6	− 0·004	+ 0·91	4
14·43	− 0·023	1·8	14·43	− 0·26	1·0	− 0·033	+ 0·02	3
16·33	− 0·040	0·6	16·30	− 1·10	0·5	− 0·045	− 0·69	4, 3
17·43	+ 0·012	0·3	17·44	− 0·28	0·5	+ 0·011	+ 0·14	3, 4
19·40	+ 0·079	0·1	19·40	− 0·77	0·2	+ 0·078	− 0·25	1
20·38	+ 0·010	2·8	20·40	− 0·28	1·6	+ 0·015	+ 0·29	6
21·45	− 0·067	0·5	21·45	− 0·45	0·4	− 0·071	+ 0·13	2
22·29	− 0·043	0·5	22·29	− 0·47	0·5	− 0·049	+ 0·12	2
23·39	− 0·002	0·1	23·39	− 0·80	0·2	− 0·007	− 0·19	1
24·39	+ 0·074	0·1	24·39	+ 0·22	0·2	+ 0·079	+ 0·82	1
25·45	− 0·006	0·3	25·45	− 0·66	0·2	+ 0·012	− 0·02	1
26·31	− 0·077	1·1	26·32	− 0·87	0·8	− 0·053	− 0·17	4
27·43	− 0·016	0·9	27·42	− 0·37	0·8	+ 0·012	+ 0·44	4
28·43	+ 0·163	0·2	28·43	− 0·46	0·1	+ 0·190	+ 0·40	1
29·39	+ 0·042	0·8	29·38	− 0·82	0·6	+ 0·073	+ 0·01	2
30·41	+ 0·001	1·1	30·40	− 0·77	1·1	+ 0·025	+ 0·05	4, 5
Dec. 1·42	+ 0·004	1·8	Dec. 1·39	− 0·24	1·0	+ 0·016	+ 0·51	2
3·10	− 0·007	0·4	3·18·	− 0·73·	0·4	− 0·004	− 0·14	2
4·37	− 0·025	2·1	4·37	+ 0·46	1·1	− 0·031	+ 0·86	3
5·38	− 0·017	2·0	5·37·	− 0·37	1·2	− 0·023	− 0·05	4
6·40	+ 0·020	0·7	6·39	+ 0·09	0·6	+ 0·028	+ 0·39	4
7·34	− 0·001	3·2	7·33	− 0·15	1·8	+ 0·020	+ 0·17	6
8·37	+ 0·010	2·2	8·36	+ 0·25	1·2	+ 0·045	+ 0·61	5
9·41	− 0·061	0·3	9·41	− 0·71	0·2	− 0·015	− 0·37	1
10·35·	− 0·051	0·4	10·35	+ 0·13·	0·4	+ 0·001	+ 0·46	2
11·39	+ 0·045·	0·4	11·39	− 0·75	0·3	+ 0·089	− 0·42	2
12·36	− 0·080	0·3	12·36	+ 0·54	0·3	− 0·042	+ 0·79	2
13·35	− 0·029	1·8	13·35	− 0·37	1·0	+ 0·005	− 0·23	3
14·34·	− 0·014	0·4	14·34	− 0·32	0·4	+ 0·013	− 0·29	2
15·30	− 0·006	0·2	15·30	+ 0·34	0·1	+ 0·015	+ 0·26	1
17·29	+ 0·066	0·2	17·29	+ 2·75	0·1	+ 0·069	+ 2·51	1
18·29	+ 0·061	0·2	18·29	+ 0·02	0·1	+ 0·053	− 0·27	1
19·34	− 0·040	0·3	19·34	+ 0·15	0·2	− 0·058	− 0·18	1
21·33	+ 0·069	0·3	21·33	+ 0·10	0·2			1
26·37	+ 0·008	0·3	26·37	− 0·63	0·2			1
27·37	− 0·005	0·3	27·37	+ 0·33	0·2			1
28·37	+ 0·084	0·3	28·37	+ 0·13	0·2			1
29·37	− 0·007	0·3	29·37	+ 0·05	0·2			1
30·37	+ 0·045	0·3	30·37	− 0·02	0·2			1
Jan. 10·34	− 0·035	0·3	Jan. 10·34	+ 0·32	0·2			1

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Four micrometrical observations of the planet were made before the beginning of the meridian observations, viz., those by Dr. Knorre at Berlin August 18 and 20, already mentioned, and two by Hr. Ristenpart at Strassburg, August 24 and 29. These observations, published in Nos. 2973 and 2947, respectively, of the *Astr. Nach.* (in which the planet was referred to stars taken from the Berlin zone of the Catalogue of the *Astronomische Gesellschaft*, so that the places are comparable at once with the "reduced positions" given above), afford the following corrections of ephemeris L_3 :—

	s	′
August 18·50	+ 0·017	− 1·44
„ 20·49	+ 0·080	+ 0·47
„ 24·58	− 0·057	− 1·76
„ 29·47	+ 0·279	− 1·66

The mean of these four corrections is inserted in the first line of the following table of means :—

Means of Differences, Observ. – Ephemeris L_3.

From obs.	Epoch R.A.	Δα	p	Epoch Dec.	Δδ	p	No. obs.
		s			′		
Aug. 18–29	Aug. 22·76	+ 0·080		Aug. 22·76	− 1·10		4
Sept. 7–16	Sept. 12·35	− 0·040	0·9	Sept. 12·35	− 1·44	0·6	3
20–22	21·91	+ 0·007	4·3	21·94	+ 0·12	1·5	6
25–28	26·82	+ 0·003	4·5	26·84	− 0·43	1·7	8
30–Oct. 2	Oct. 1·39	− 0·051	3·1	Oct. 1·43	− 0·28	1·3	6
Oct. 3– 6	4·87	− 0·022	1·6	4·89	0·00	0·9	7, 6
7–11	8·68	− 0·019	1·2	8·68	− 0·12	0·6	5
13–16	14·69	− 0·014	1·6	15·10	+ 0·20	1·3	7
17–20	19·29	− 0·011	6·0	19·29	− 0·08	3·1	10
22–25	24·52	− 0·020	6·3	24·40	− 0·25	3·7	10
26–29	27·92	− 0·038	4·1	27·93	− 0·30	2·3	8
30–Nov. 3	31·93	− 0·008	2·9	31·86	− 0·54	2·1	12
Nov. 5– 8	Nov. 6·83	+ 0·069	1·5	Nov. 6·76	+ 0·06	1·3	5
9–13	10·93	+ 0·020	8·4	11·14	− 0·16	4·6	14
14–19	15·26	− 0·019	2·8	15·98	− 0·50	2·2	11
20–23	20·81	− 0·007	3·9	21·13	− 0·38	2·7	11
24–27	26·54	− 0·039	2·4	26·48	− 0·54	2·0	10
28–Dec. 1	30·57	+ 0·019	3·9	30·46	− 0·58	2·8	9, 10
Dec. 3– 7	Dec. 5·85	− 0·009	8·4	Dec. 5·80	− 0·09	5·1	19
8–11	9·07	0·000	3·3	9·27	− 0·01	2·1	10
12–15	13·53	− 0·031	2·7	13·51	− 0·17	1·8	8
17–21	19·32	+ 0·034	1·0	19·15	+ 0·54	0·6	4
26–30	28·37	+ 0·025	1·5	28·37	− 0·03	1·0	5
Jan. 10	Jan. 10·34	− 0·035	0·3	Jan. 10·34	+ 0·32	0·2	1

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It must be borne in mind that the normals to which the definitive ephemeris was adapted were systematically 0″·21 north of those of the above table; it is for this reason that the $\Delta\delta$ came out negative nearly throughout. Except for this, from September 12 to January 10 the mean differences should not exceed quantities which could be attributed to the errors of the observation, as ephemeris L_3 rests upon what really is nothing else but some interpolation-formula computed to represent, as nearly as possible with the given number and connection of constants, a set of normals which, but for the mentioned difference of the Declinations, were practically identical with those here derived. In fact, all the $\Delta\alpha$ and $\Delta\delta$, the latter being changed by $+0''\cdot21$, do not exceed quantities which would be considered, separately and altogether, indifferent in any ordinary determination of a planet's orbit. But in the present case, where, to make full use of all observations to determine the parallax, it is required to have the computed motion of the planet during an interval of some days agreeing with the true motion to 0″·1, it is a question further to be discussed whether that interpolation formula can be safely relied upon.

Plotting then the values of the above table for September 12 to January 10, no regular variation can be perceived at once in the $\Delta\alpha$, while the $\Delta\delta$ generally correspond to a simple smooth curve rising from $-0''\cdot65$, September 12, to $+0''\cdot08$, October 13, then descending to $-0''\cdot53$, November 19, and again rising till $+0''\cdot4$, January 10. There is a marked deviation, however, of the $\Delta\delta$ from this curve for a fortnight at the beginning of November, as it can be seen in the above table that the normals for November 6·76 and 11·14 are at variance with the preceding as well as with the following three or four normals. Though 19 observations were used to form these two normals, yet their apparent discrepancy might be attributed to an accidental grouping of errors in these observations, if that discrepancy stood alone; but a corresponding discrepancy is shown, in a most striking manner, in the $\Delta\alpha$ of the same groups. Thence the question arises, whether the origin is not in the ground-work of the computation of the ephemerides, and thence the further question, whether the definitive ephemeris L_3 throughout can be relied upon closely enough to be used in the comparisons for parallax.

Differences to an unexpected extent had already been noticed by Dr. Elkin, early in 1891, between an ephemeris he had computed for *Iris* and the ephemeris L_2, then communicated to him, which only partially were explained by the differences, unexpectedly considerable too, found between the co-ordinates of the Earth, used in his computation and in that made at the *Jahrbuch* office. Professor Tietjen failed to discover the origin of these differences; he could not find any error in the Berlin computations, but the author is not aware that the examination was carried far enough. A comparison of Dr. Elkin's ephemeris, used in his discussion of the heliometer

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observations, with the definitive Berlin ephemeris L_3, is given in the following table, which besides, for the period October 9 to December 14, shows the corrections derived by Dr. Elkin from the heliometer observations for his ephemeris, and the corresponding differences, Heliometer observations – Ephemeris L_3. The terms included in Dr. Elkin's ephemeris depending upon 2α and $\alpha - \Gamma'$ were again deducted beforehand, as they are not included in the Berlin ephemerides, and should not be included, because the observed places of the planet are obtained free from them according to the process of reduction.

Greenwich midnight	Eph. Elkin — Eph. L_3		Corr. Eph. Elkin from Hel. obs.		Adopted Hel. obs. — L_3		Greenwich midnight	Eph. Elkin — Eph. L_3		Corr. Eph. Elkin from Hel. obs.		Adopted Hel. obs. — L_3	
	s	″	s	″	s	″		s	″	s	″	s	″
Sept. 16	+0·011	−0·62					Oct. 16	−0·003	−0·33	−0·017	+0·76	−0·033	+0·04
17	+ ·025	−0·58					17	− ·021	−0·48	− ·009	+0·82	− ·044	−0·05
18	+ ·033	−0·51					18	− ·035	−0·64	− ·002	+0·87	− ·049	−0·16
19	+ ·036	−0·46					19	− ·038	−0·74	+ ·006	+0·93	− ·045	−0·20
20	+ ·040	−0·44					20	− ·039	−0·82	+ ·014	+0·98	− ·038	−0·23
21	+ ·049	−0·42					21	− ·044	−0·87	+ ·022	+1·04	− ·036	−0·22
22	+ ·053	−0·39					22	− ·044	−0·90	+ ·029	+1·09	− ·028	−0·21
23	+ ·064	−0·29					23	− ·042	−0·90	+ ·037	+1·15	− ·018	−0·14
24	+ ·076	−0·18					24	− ·043	−0·86	+ ·045	+1·20	− ·010	−0·05
25	+ ·086	−0·07					25	− ·049	−0·84	+ ·053	+1·25	− ·008	+0·02
26	+ ·075	+0·02					26	− ·058	−0·92	+ ·061	+1·30	− ·010	−0·01
27	+ ·101	+0·11					27	− ·071	−1·09	+ ·069	+1·36	− ·015	−0·12
28	+ ·103	+0·24					28	− ·087	−1·18	+ ·077	+1·41	− ·023	−0·16
29	+ ·100	+0·36					29	− ·103	−1·19	+ ·085	+1·47	− ·032	−0·11
30	+ ·095	+0·26				−0·32	30	− ·115	−1·23	+ ·093	+1·52	− ·035	−0·10
Oct. 1	+ ·087	+0·11				−0·29	31	− ·114	−1·33	+ ·101	+1·58	− ·026	−0·14
2	+ ·085	+0·08				−0·25	Nov. 1	− ·107	−1·43	+ ·108	+1·63	− ·012	−0·19
3	+ ·094	+0·08				−0·22	2	− ·095	−1·47	+ ·116	+1·70	+ ·008	−0·16
4	+ ·105	+0·07			−0·036	−0·17	3	− ·081	−1·50	+ ·123	+1·75	+ ·029	−0·14
5	+ ·105	+0·06			− ·025	−0·11	4	− ·074	−1·51	+ ·129	+1·80	+ ·042	−0·10
6	+ ·108	+0·02			− ·015	−0·03	5	− ·079	−1·52	+ ·135	+1·85	+ ·043	−0·06
7	+ ·107	+0·04			− ·005	+0·05	6	− ·085	−1·50	+ ·140	+1·90	+ ·042	+0·01
8	+ ·102	+0·08			+ ·005	+0·15	7	− ·093	−1·48	+ ·145	+1·94	+ ·039	+0·07
9	+ ·096	+0·22	−0·070	+0·41	+ ·012	+0·24	8	− ·108	−1·49	+ ·149	+1·97	+ ·028	+0·09
10	+ ·091	+0·14	− ·063	+0·46	+ ·015	+0·21	9	− ·121	−1·59	+ ·153	+2·00	+ ·019	+0·02
11	+ ·085	+0·16	− ·057	+0·51	+ ·016	+0·28	10	− ·128	−1·94	+ ·155	+2·03	+ ·014	−0·30
12	+ ·074	+0·09	− ·048	+0·56	+ ·013	+0·26	11	− ·133	−1·80	+ ·156	+2·03	+ ·011	−0·16
13	+ ·046	−0·04	− ·040	+0·61	− ·007	+0·18	12	− ·133	−1·80	+ ·156	+2·01	+ ·009	−0·18
14	+ ·019	−0·13	− ·033	+0·66	− ·027	+0·14	13	− ·148	−1·81	+ ·154	+1·98	− ·006	−0·22
15	+ ·007	−0·21	− ·025	+0·71	− ·030	+0·11	14	− ·127	−1·83	+ ·152	+1·94	+ ·011	−0·28

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Greenwich midnight	Eph. Elkin — Eph. L_3		Corr. Eph. Elkin from Hel. obs.		Adopted Hel. obs. — L_3		Greenwich midnight	Eph. Elkin — Eph. L_3		Corr. Eph. Elkin from Hel. obs.		Adopted Hel. obs. — L_3	
	s	″	s	″	s	″		s	″	s	″	s	″
Nov. 15	−0·127	−1·85	+0·148	+1·88	+0·008	−0·36	Dec. 4	+0·076	−0·16	−0·056	+0·17	+0·007	−0·38
16	− ·125	−1·85	+ ·143	+1·82	+ ·005	−0·42	5	+ ·087	−0·03	− ·068	+0·11	+ ·006	−0·31
17	− ·121	−1·78	+ ·135	+1·75	+ ·001	−0·42	6	+ ·083	+0·04	− ·079	+0·05	− ·010	−0·30
18	− ·110	−1·74	+ ·127	+1·66	+ ·004	−0·47	7	+ ·079	+0·07	− ·090	−0·00	− ·024	−0·33
19	− ·104	−1·69	+ ·118	+1·56	+ ·001	−0·52	8	+ ·076	+0·09	− ·099	−0·05	− ·037	−0·36
20	− ·102	−1·64	+ ·109	+1·46	− ·006	−0·57	9	+ ·074	+0·16	− ·108	−0·10	− ·047	−0·34
21	− ·082	−1·55	+ ·100	+1·36	+ ·004	−0·58	10	+ ·074	+0·21	− ·114	−0·15	− ·053	−0·33
22	− ·070	−1·46	+ ·089	+1·26	+ ·007	−0·59	11	+ ·091	+0·25	− ·120	−0·18	− ·042	−0·33
23	− ·061	−1·37	+ ·079	+1·15	+ ·005	−0·61	12	+ ·099	+0·37	− ·123	−0·21	− ·037	−0·23
24	− ·061	−1·26	+ ·068	+1·05	− ·006	−0·60	13	+ ·105	+0·50	− ·125	−0·22	− ·033	−0·12
25	− ·063	−1·20	+ ·057	+0·95	− ·019	−0·64	14	+ ·113	+0·61	− ·126	−0·23	− ·026	−0·01
26	− ·057	−1·18	+ ·045	+0·85	− ·025	−0·72	15	+ ·130	+0·85			− ·020	+0·10
27	− ·048	−1·18	+ ·032	+0·75	− ·028	−0·82	16	+ ·145	+1·07			− ·012	+0·19
28	− ·034	−1·12	+ ·020	+0·65	− ·027	−0·86	17	+ ·156	+1·26			·000	+0·25
29	− ·026	−0·99	+ ·007	+0·55	− ·032	−0·83	18	+ ·175	+1·40			+ ·010	+0·31
30	− ·003	−0·88	− ·007	+0·45	− ·023	−0·82	19	+ ·184	+1·53			+ ·020	+0·34
Dec. 1	+ ·022	−0·72	− ·020	+0·37	− ·011	−0·74	20	+ ·182	+1·67			+ ·030	+0·35
2	+ ·037	−0·58	− ·032	+0·29	− ·008	−0·68	21	+ ·189	+1·79				
3	+ ·056	−0·39	− ·044	+0·23	− ·001	−0·55	22	+ ·198	+1·89				

Variations of the difference between the two ephemerides for succeeding days up to the amount of 0″·1 are entirely within the limits of uncertainty of the computations made with 7-figure logarithms. But besides these, there are in many places regular variations of short period, some of which rise to a considerable amount. For the period mentioned above, viz., from the end of October till near the middle of November, the variation of the error of ephemeris L_3, as given by the observations, corresponds in Declination very nearly with the differences Elk. − L_3, while the comparison of the Right Ascensions exhibits the same feature, though in this case the agreement of Elkin's computation with the observations is not so close throughout the period in question. It becomes apparent, therefore, that the rapid variation of the differences, Obs. − Ephem. L_3, within that period is not due to the accidental errors of the observations, but that the computed motion of the planet is in error about this time; and after this is thus proved for one period, it must be regarded as probable that also the other, more or less marked, numerous indentations of the curves representing the differences Eph. Elkin − L_3, or Elk. corr. from Hel. Obs. − L_3, point to real errors of ephemeris L_3, which must be taken into account in the comparison of the observations.

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For the normals comprised within the period of the heliometer observations, the following comparison can be made :—

Epoch for R.A. and Dec.		Mer. obs. — L_3 $\Delta\alpha$	$\Delta\delta$	Eph. Elk. corr. from Hel. — Eph. L_3		Elkin's Hel. Curve — Mer. obs.		Residuals $\Delta\alpha$	$\Delta\delta$
		s	″	s	″	s	″	s	″
Oct.	8·7, 8·7	— 0·019	— 0·12	+ 0·021	+ 0·64 :	+ 0·040	+ 0·76	+ 0·027	+ 0·35
	14·7, 15·1	— 0·014	+ 0·20	— 0·013	+ 0·52	+ 0·001	+ 0·32	— 0·012	— 0·09
	19·3, 19·3	— 0·011	— 0·08	— 0·033	+ 0·20	— 0·022	+ 0·28	— 0·035	— 0·13
	24·5, 24·4	— 0·020	— 0·25	+ 0·003	+ 0·34	+ 0·023	+ 0·59	+ 0·010	+ 0·18
	27·9, 27·9	— 0·038	— 0·30	— 0·004	+ 0·25	+ 0·034	+ 0·55	+ 0·021	+ 0·14
	31·9, 31·9	— 0·008	— 0·54	— 0·008	+ 0·23	+ 0·001	+ 0·77	— 0·012	+ 0·36
Nov.	6·8, 6·8	+ 0·069	+ 0·06	+ 0·054	+ 0·42	— 0·015	+ 0·36	— 0·028	— 0·05
	10·9, 11·1	+ 0·020	— 0·16	+ 0·026	+ 0·18	+ 0·006	+ 0·34	— 0·007	— 0·07
	15·3, 16·0	— 0·019	— 0·50	+ 0·022	0·00	+ 0·041	+ 0·50	+ 0·028	+ 0·09
	20·8, 21·1	— 0·007	— 0·38	+ 0·010	— 0·19	+ 0·017	+ 0·19	+ 0·004	— 0·22
	26·5, 26·5	— 0·039	— 0·54	— 0·012	— 0·33	+ 0·027	+ 0·21	+ 0·014	— 0·20
	30·6, 30·5	+ 0·019	— 0·58	— 0·009	— 0·42	— 0·028	+ 0·16	— 0·041	— 0·25
Dec.	5·8, 5·8	— 0·009	— 0·09	+ 0·014	+ 0·08	+ 0·023	+ 0·17	+ 0·010	— 0·24
	9·1, 9·3	0·000	— 0·01	— 0·030	+ 0·05	— 0·030	+ 0·06	— 0·043	— 0·35
	13·5, 13·5	— 0·031	— 0·17	— 0·020	+ 0·28	+ 0·011	+ 0·45	— 0·002	+ 0·04

As the star places used by Elkin differed systematically from those used in the present discussion by $+0^s{\cdot}016$ and $+0''{\cdot}44$, these same differences should be shown in the column "Elkin's Hel. Curve – Mer. obs." The means of the values of this column for the 15 normals, however, taken by weights as assigned above, are $+0^s{\cdot}008$ and $+0''{\cdot}34$. Giving weights 2 and 1, respectively, to the values of the systematic differences thus found by the two ways, the reduction to be applied to Elkin's ephemeris, corrected from his curve adapted to the heliometer observations, is found : $-0^s{\cdot}013$ $-0''{\cdot}41$.

Applying this reduction, the residuals given in the last column of the above table remain. These values clearly appear to be nothing but accidental errors—appearing with opposite sign in the table—of the observations in Right Ascension ; while in Declination, though all of the separate values are quite small and singly within the error of observation, the whole of the series perhaps shows that Elkin's heliometer curve makes the planet move to the south a little too fast, at the rate of about $0''{\cdot}0067$ daily.

It has been assumed, however, that the following expressions—

R.A., Eph. Elk. — L_3 + Corr. $\Delta\alpha$ to Eph. Elk. from Hel. Curve — $0^s{\cdot}013$, and
Dec., Eph. Elk. — L_3 + Corr. $\Delta\delta$ to Eph. Elk. from Hel. Curve — $0''{\cdot}41$

give the true amount of error of ephemeris L_3 throughout the period October 9·5 to December 14·5. The values of this expression for every day are given with the table, pp. [26] and [27], under the heading "Adopted Hel. obs. – L_3," and extended, by

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graphical extrapolation, guided by the normals from the meridian observations, some days backward and forward. Comparing then with them the differences of the separate observations from L_3, the outstanding errors v were found, which very approximately can be adopted as the real errors of the observations, and are inserted in the tables, pp. [18]–[21] and pp. [22]–[23]. In all this part of the discussion however, instead of the systematic reduction $-0''\cdot41$, or which with one more decimal place should have been $-0''\cdot406$, the number $-0''\cdot393$, proceeding from a previous computation, was inadvertently used. All the definitive comparisons, therefore, are affected with a constant error of $0''\cdot01$, which it was deemed unnecessary to correct afterwards.

Besides these errors v, which could only be determined for the period October 4 to December 20 for Right Ascension, and September 30 to December 20 for Declination, another column of errors v' is given with the tables, pp. [11]–[16]. Curves were drawn through the normals, Mer. obs. – Eph. L_3, as simple as possible, but fulfilling the condition that they should not deviate more than $0^s\cdot02$, and $0''\cdot25$ or $0''\cdot3$ respectively, from any normal having a weight not less than 1—a condition to be imposed after it had become known that there are considerable irregularities of small period in the ephemeris L_3. From these curves the following co-ordinates are taken, giving the ephemeris-error as directly shown by the whole of the meridian observations; and supposing the numbers of the table to show the true amount of correction, the errors v' would be those of the separate observations.

Corrections to Ephemeris L_3 from Meridian Observations.

Gr. midn.	$\Delta\alpha$	$\Delta\delta$	Gr. midn.	$\Delta\alpha$	$\Delta\delta$	Gr. midn.	$\Delta\alpha$	$\Delta\delta$
	s	″		s	″		s	″
Sept. 12	− 0·008·	− 0·62·	Oct. 1	− 0·030	− 0·08·	Oct. 20	− 0·012·	− 0·10
13	− 6	− 0·59·	2	− 33	− 0·06	21	− 14	− 0·14
14	− 4	− 0·56·	3	− 33	− 0·04	22	− 15·	− 0·17
15	− 2	− 0·53	4	− 32·	− 0·02	23	− 17·	− 0·22
16	0	− 0·50	5	− 30·	0·00	24	− 20	− 0·25·
17	+ 1	− 0·46	6	− 28	+ 0·02·	25	− 24·	− 0·29
18	+ 2	− 0·43·	7	− 26	+ 0·04·	26	− 30	− 0·33
19	+ 3	− 0·40·	8	− 23·	+ 0·06	27	− 37	− 0·37
20	+ 3	− 0·37·	9	− 21·	+ 0·08	28	− 39	− 0·40·
21	+ 3	− 0·35	10	− 19	+ 0·09·	29	− 36	− 0·44
22	+ 2·	− 0·32	11	− 17	+ 0·11	30	− 30	− 0·46
23	+ 1·	− 0·29	12	− 15	+ 0·11·	31	− 19	− 0·46·
24	0	− 0·26	13	− 14	+ 0·12	Nov. 1	− 6	− 0·42·
25	− 2	− 0·24	14	− 13	+ 0·12	2	+ 10	− 0·36
26	− 4·	− 0·21	15	− 12	+ 0·10	3	+ 27·	− 0·28
27	− 8	− 0·18·	16	− 11	+ 0·07·	4	+ 41	− 0·18
28	− 12·	− 0·16·	17	− 11	+ 0·03	5	+ 51·	− 0·07·
29	− 16	− 0·13·	18	− 11	− 0·01·	6	+ 55·	0·00
30	− 24	− 0·11·	19	− 11·	− 0·06	7	+ 50	+ 0·03

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Gr. midn.	Δα	Δδ	Gr. midn.	Δα	Δδ	Gr. midn.	Δα	Δδ
	s	″		s	″		s	″
Nov. 8	+ 0·048	+ 0·04	Nov. 26	— 0·018·	— 0·52	Dec. 14	— 0·032·	— 0·07·
9	+ 40	+ 0·02	27	— 15	— 0·52	15	— 29	— 0·05
10	+ 31·	— 0·02·	28	— 10	— 0·51	16	— 21	— 0·03
11	+ 22	— 0·09	29	— 5	— 0·50	17	— 4	— 0·01
12	+ 10	— 0·17	30	+ 0·	— 0·47·	18	+ 10	+ 0·01
13	+ 2·	— 0·23	Dec. 1	+ 5·	— 0·44	19	+ 21	+ 0·03
14	— 2	— 0·29	2	+ 7	— 0·41	20	+ 27	+ 0·05·
15	— 5·	— 0·33	3	+ 7	— 0·38	21	+ 30	+ 0·08
16	— 9	— 0·37	4	+ 5	— 0·34·	22	+ 29	+ 0·11
17	— 12·	— 0·40	5	+ 3	— 0·30·	23	+ 28	+ 0·13
18	— 15	— 0·43	6	+ 1	— 0·27	24	+ 26	+ 0·16
19	— 17	— 0·45·	7	— 2·	— 0·24	25	+ 23	+ 0·18
20	— 19·	— 0·47·	8	— 7·	— 0·22	26	+ 19	+ 0·20
21	— 21·	— 0·49·	9	— 14	— 0·18·	27	+ 16	+ 0·22
22	— 23	— 0·50·	10	— 23	— 0·16·	28	+ 13	+ 0·24
23	— 23	— 0·51	11	— 30	— 0·13·	29	+ 9	+ 0·26
24	— 23	— 0·51·	12	— 33	— 0·12	30	+ 6	+ 0·28
25	— 21	— 0·52	13	— 34	— 0·10	31	+ 3	+ 0·29

For the determination of parallax from the Declinations, it has been preferred to take the motion of the planet between the epochs of the observations in the northern and of those made in the southern hemisphere from Elkin's ephemeris, corrected by his heliometer curve. Forming 12 groups, therefore, of the apparent errors v, and taking means according to the weights adopted for the separate observations, the following is the comparison :—

Determination of Parallax.

Group	Obs. from N. Hem.				Obs. from S. Hem.				Diff. v S. — N.	p	Parallax			Fact. $\Delta\pi$	$\Delta\pi$	Wt.
	No.	Epoch	Mean v	p	No.	Epoch	Mean v	p			N.	S.	Sum			
			″				″		″		″	″	″		″	
Oct. 13 to 18	8	16·27	+0·105	1·7	2	16·02	+0·040	0·4	—0·065	0·32	4·76	8·47	13·23	1·503	—0·043	0·72
„ 20 „ 24	9	23·48	+0·031	2·7	1	22·49	+0·450	0·2	+0·419	0·19	4·98	8·59	13·57	1·542	+0·272	0·46
„ 25 „ 27	6	26·27	—0·447	2·1	1	26·48	—0·440	0·2	+0·007	0·19	5·08	8·60	13·68	1·554	+0·005	0·46
„ 28 „ N.3	10	30·45	—0·257	2·4	5	31·35	—0·051	0·9	+0·206	0·73	5·28	8·57	13·85	1·574	+0·131	0·18
Nov. 5 „ 8	2	6·95	+0·030	0·8	3	6·44	+0·072	0·5	+0·042	0·31	5·17	8·44	13·61	1·546	+0·027	0·74
„ 11 „ 14	8	12·67	—0·142	3·1	4	13·20	+1·175	0·6	+1·317	0·50	5·37	8·28	13·65	1·551	+0·849	1·20
„ 16 „ 20	9	19·17	+0·134	1·9	5	19·03	—0·133	0·9	—0·267	0·61	5·36	8·11	13·47	1·530	—0·175	1·43
„ 21 „ 25	4	22·67	—0·053	0·9	3	23·27	+0·473	0·6	+0·526	0·36	5·34	7·83	13·17	1·496	+0·352	0·81
„ 26 „ D.1	13	29·29	+0·211	3·4	5	28·63	+0·118	1·0	—0·093	0·78	5·25	7·55	12·80	1·454	—0·064	1·65
Dec. 3 „ 6	9	5·15	+0·570	2·6	4	4·26	—0·596	0·7	—1·166	0·55	5·17	7·17	12·34	1·398	—0·834	1·07
„ 7 „ 9	9	7·91	+0·354	2·6	3	7·57	+0·087	0·6	—0·267	0·49	5·13	6·98	12·11	1·376	—0·195	0·93
„ 10 „ 15	8	12·88	+0·115	1·9	4	12·34	—0·402	0·6	—0·517	0·46	4·94	6·59	11·53	1·310	—0·395	0·79
														Mean	—0″·029	

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Hence the value of the solar parallax results

$$8''\cdot771$$

with the computed weight 10·44. The mean error for weight 1, however, is found, from the differences between the 12 determinations of $\Delta\pi$, much larger than was anticipated, because the series contains two very discordant values. In the sixth group, the largely erroneous correction $\Delta\pi$ arises from a common error of the four southern observations, which accidentally has made all of them too northerly, the three Cape observations, November 12, 13, 14, in the mean by 1″·17, and the Melbourne observation, November 13, by 1″·03, very nearly. In the tenth group, the large error of $\Delta\pi$, in the opposite sense, is to be divided equally between the northern and the southern observations, accidentally all of the nine northern ones making the Declination too great, and two of the three Cape observations and the Melbourne observation belonging to this group considerably too small. There was no reason beforehand to doubt of the general accuracy of any of these observations, and they ought to be retained, therefore, with the weights previously assigned to them. They make however the sum of the squares of the outstanding errors very large, viz.: $\Sigma\, p\cdot vv = 1\cdot9541$, the two discordant groups alone contributing five-sixths to this quantity; whence the mean error for the unity of weights, instead of $\pm 0''\cdot316$ as was anticipated (or $\pm 0''\cdot33$ if account is taken of the slight change of the unity of weights connected with the oversight in determining the weight of the separate places of the planet spoken of above) becomes $= \pm 0''\cdot422$, and the mean error of the determination of the solar parallax from the *Iris* meridian observations is $= \pm 0''\cdot130$, or the probable error $= \pm 0''\cdot088$.

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MERIDIAN OBSERVATIONS OF VICTORIA.

Four hundred and five meridian observations of *Victoria* were secured at 21 of the 22 contributing observatories, 22 of them however outside of the three-month interval symmetrically enclosing the heliometer observations, June 3 to September 2. The planet was observed at the observatories of—

Algiers	on	15	days	(1 day Dec. only)
Berlin	„	21	„	(1 day R.A. only) including 2 obs. Sept. 15 and 18
Cambridge (Eng.)	„	14	„	
Cambridge (Mass.)	„	12	„	
Cape of Good Hope	„	47	„	
Cincinnati	„	8	„	
Cordoba	„	26	„	
Dublin	„	4	„	
Greenwich	„	15	„	
Hamburg	„	6	„	
Mt. Hamilton	„	12	„	
Königsberg	„	12	„	(1 day R.A. only)
Leiden	„	13	„	
Leipzig	„	37	„	including 2 obs. Sept. 3 and 4
Melbourne	„	11	„	(1 day R.A. only)
Naples	„	48	„	
Oxford	„	14	„	
Paris, G.I.M.	„	21	„	
„ C. du J.	„	14	„	
Pulkowa	„	41	„	including 18 obs. Sept. 3 — Oct. 27
Vienna, Ku.	„	6	„	
Washington	„	8	„	

The Right Ascensions and Declinations of *Victoria*, as communicated from the different observatories, were corrected for the mean deviation of the places of such of the comparison or reference stars as had been observed on the same day from the definitive normal places contained in the table, Vol. II., pp. 612–3, whenever a sufficient number of these stars was observed with the planet. When none of them were observed, the general reduction of the series was applied to the planet's place, taken from the table, Vol. II., p. 570, with the additional correction $+ 0^s{\cdot}0015\ (M - 8)$; and a mean was approximately formed, as stated in detail below, from this general reduction and a special day correction, whenever the latter was afforded by an unusually small number of comparison stars only.

Due allowance had to be made, of course, for the difference between the magnitude of the planet and the mean magnitude of the stars observed with it. The planet's magnitude originally was computed, according to the *Berliner Jahrbuch*, from the formula: Mag. $= 7{\cdot}2 + 5 \log r\Delta$, which makes the mean opposition magnitude $= 9{\cdot}67$, and would have made the magnitude at opposition in 1889 $= 8{\cdot}1$. The estimates however made with the meridian observations at six observatories agree in showing that the planet was considerably fainter. The following are the particulars :—

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Berlin

1889	Mag. obs.	Mag. comp.	O—C
June 7	8·8	8·51	+0·29
10	8·5	8·46	+0·04
17	8·7	8·35	+0·35
20	8·8	8·31	+0·49
26	8·5	8·23	+0·27
July 31	8·3	8·13	+0·17
Aug. 1	8·5	8·14	+0·36
7	8·2	8·19	+0·01
18	8·6	8·32	+0·28
30	8·8	8·50	+0·30
31	8·9	8·51	+0·39
Sept. 15	9·3	8·78	+0·52
18	9·3	8·83	+0·47
Mean ...			+0·30

Hamburg

1889	Mag. obs.	Mag. comp.	O—C
June 22	8·7	8·28	+0·42
24	8·6	8·26	+0·34
25	8·5	8·25	+0·25
July 27	8·3	8·12	+0·18
Mean ...			+0·30

Cordoba

1889	Mag. obs.	Mag. red.	Mag. comp.	O—C
July 2	8	7·56	8·17	—0·61
3	9½	8·83	8·16	+0·67
4	8¾	8·20	8·15	+0·05
5	9¼	8·62	8·15	+0·47
13	8½	7·98	8·11	—0·13
15	8½	7·98	8·11	—0·12
16	8½	7·98	8·10	—0·12
17	8½	7·98	8·10	—0·11
18	8½	7·98	8·10	—0·12
19	8½	7·98	8·10	—0·11
20	8½	7·98	8·10	—0·12
22	9¾	9·05	8·10	+0·95
25	8¼	7·77	8·11	—0·34
29	8½	7·98	8·12	—0·14
30	8¾	8·20	8·13	+0·07
Aug. 1	8½	7·98	8·13	—0·15
2	8½	7·98	8·13	—0·15
3	8½	7·98	8·13	—0·15
5	8½	7·98	8·17	—0·19
18	8¾	8·20	8·32	—0·12
19	9½	8·84	8·34	+0·50
22	9¼	8·62	8·37	+0·25
24	9	8·41	8·40	+0·04
27	9½	8·83	8·44	+0·39
28	9¼	8·62	8·47	+0·15
29	9½	8·84	8·49	+0·35
Mean ...				+0·05

Cambridge (Mass.)

1889	Mag. obs.	Mag. comp.	O—C
June 22	8·5	8·28	+0·22
29	8·8	8·20	+0·60
July 15	8·4	8·10	+0·30
18	8·6	8·10	+0·50
21	8·1	8·10	0·00
22	8·2	8·10	+0·10
Aug. 6	8·6	8·18	+0·42
20	8·8	8·34	+0·46
21	8·8	8·36	+0·44
22	8·7	8·38	+0·32
28	8·9	8·47	+0·43
30	8·8	8·50	+0·30
Mean ...			+0·34

Oxford

1889	Mag. obs.	Mag. comp.	O—C
June 26	9–8	8·23	+0·44
July 5	8–9	8·15	+0·18
10	8	8·12	—0·12
23	8–9	8·10	+0·23
Aug. 5	8–9	8·17	+0·16
15	9	8·28	+0·72
17	9–10	8·30	+1·03
29	10–9	8·48	+1·19
Mean ...			+0·48

Pulkowa

1889	Mag. obs.	Mag. comp.	O—C
Sept. 7	9·3	8·63	+0·72
15	9·4	8·78	+0·62
18	9·4	8·83	+0·57
22	9·7	8·90	+0·80
24	9·6	8·94	+0·66
28	9·3	9·01	+0·29
Oct. 2	9·5	9·08	+0·42
3	9·5	9·09	+0·41
4	9·5	9·11	+0·39
5	9·5	9·13	+0·37
14	9·6	9·30	+0·30
17	9·5	9·35	+0·15
23	9·7	9·46	+0·24
24	9·7	9·48	+0·22
25	9·7	9·49	+0·26
27	9·8	9·53	+0·27
Mean ...			+0·42

From the estimates made with the observations of the stars at Cambridge, Cordoba, and Oxford, the following mean differences from the adopted magnitudes were found :—

Cambridge, obs. mag.	5·4 to 7·9,	mean 6·72,	12 stars	+0·25	
,,	8·0 ,, 8·1	,, 8·04	9 ,,	+0·19	+0·27
,,	8·2 ,, 8·3	,, 8·29	8 ,,	+0·36	
,,	8·5 ,, 8·6	,, 8·53	12 ,,	+0·26	
Cordoba, obs. mag.	5·9 ,, 7·8,	mean 7·10,	8 stars	+0·34	+0·44 +0·15 (M — 8)
,,	8·0 ,, 8·4	,, 8·23	10 ,,	+0·45	
,,	8·5 ,, 8·7	,, 8·58	9 ,,	+0·51	
,,	8·8 ,, 9·1	,, 8·89	10 ,,	+0·58	
Oxford, obs. mag.	5·3 ,, 7·3,	mean 6·66,	7 stars	—0·11	
,,	7·7 ,, 7·9	,, 7·78	12 ,,	—0·09	
,,	8·0 ,, 8·7	,, 8·39	14 ,,	+0·16	

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It appears that the Cambridge estimates make stars which in Argelander's scale are $8^m{\cdot}0$ $0^m{\cdot}27$ fainter; the Cordoba observer estimated still fainter, and his error seems to increase for fainter stars. The reduction $-0{\cdot}27$, therefore, was applied to the mean value of O—C for Cambridge; for Cordoba the reduction $-0{\cdot}44$ $-0{\cdot}15$ (M − 8) is already applied in the above comparison of the individual observations. The Oxford estimates appear sensibly to agree with Argelander's scale, and the same has been assumed, as very probable, for the Berlin, Hamburg, and Pulkowa observers.

The mean correction to be applied to the computed numbers for the magnitude of *Victoria*, therefore, is found in this way—

from	Berlin obs.	+0·30
„	Cambridge, Mass. obs.	+0·07
„	Cordoba obs.	+0·05
„	Hamburg „	+0·30
„	Oxford „	+0·48
„	Pulkowa „	+0·42

The value +0·3 has been used as a probable mean from these determinations, making the mean opposition magnitude of *Victoria* = 9·97, with which the following ephemeris was computed for Berlin midnight:—

		m			m			m			m
June	0	8·93	July	10	8·42	August	19	8·63	September	28	9·31
	10	8·76		20	8·40		29	8·78	October	8	9·48
	20	8·61		30	8·43	September	8	8·95		18	9·67
	30	8·49	August	9	8·51		18	9·13		28	9·84

The actual method of deriving the corrected places of the planet was as follows:—

To the observed Right Ascensions of the stars observed with the planet, as communicated in the different series, the corrections b(M − 8) were applied, where the co-efficient b is, for

	s		s		s
Algiers	− 0·0120	Greenwich	− 0·0187	Oxford	− 0·0213
Berlin	+ 0·0015	Hamburg	+ 0·0009	Paris, G. I. M.	+ 0·0050
Cambridge (Eng.)	− 0·0300	Mt. Hamilton	− 0·0158	„ C. du J.	− 0·0060
Cambridge (Mass.)	− 0·0222	Königsberg	− 0·0898	Pulkowa	+ 0·0068
Cape of Good Hope	− 0·0206	Leiden	− 0·0124	Vienna, obs. H.	− 0·0020
Cincinnati	− 0·0057	Leipzig	− 0·0095	„ obs. O.	− 0·0236
Cordoba	− 0·0216	Melbourne	− 0·0098	Washington	− 0·0214
Dublin	− 0·0376	Naples	− 0·0048		

Besides, for Berlin the magnitude equation was applied as determined by the observer himself, as had been done already in the Right Ascensions communicated from Leiden. To the Cape Right Ascensions corrected by $-0^s{\cdot}0206$ (M − 8) the following quantities were added:—for stars brighter than $6^m{\cdot}9$, obs. Cox $+0^s{\cdot}001$; for stars $7^m{\cdot}0$ and fainter: obs. Maclear $-0^s{\cdot}025$, obs. Pett $+0^s{\cdot}003$, obs. Cox $+0^s{\cdot}022$. In case of Königsberg, Leiden and Naples, the hourly variation of R.A. was allowed for by further applying the reductions: $-0^s{\cdot}030\ (t - 19^h\,44^m)$, $-0^s{\cdot}037\ (t - 19^h\,40^m)$, $+0^s{\cdot}022\ (t - 18^h\,38^m{\cdot}6)$.

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To the communicated Declinations the following corrections only were previously applied: for Königsberg, $-0''\cdot30\ (M-8)$; for Cape of Good Hope, bright stars, obs. Pett $+0''\cdot09$, obs. Cox, $-0''\cdot10$; faint stars ($7^m\cdot0$ and below), Maclear $+0''\cdot01$ Pett $+0''\cdot20$, Cox $-0''\cdot20$.

After these reductions, the individual determinations were compared with the normal Right Ascensions and Declinations, and simple means of all the differences found for the same day were formed. These mean values are the corrections to be applied to the observatories' determination of the place of an $8^m\cdot0$-star for that day, and in case of the Königsberg, &c., R.A., for the epoch 19^h44^m sid. time, &c.

To the observed places of *Victoria* were added: 1st, the day correction for an $8^m\cdot0$-star found in the manner just described; 2nd, the further correction $b(M_{Vict.}-8)$, $M_{Vict.}$ being taken from the ephemeris given above; 3rd, when necessary, the reduction to the epoch of the mean day correction; 4th, in case of Berlin, the observer's magnitude equation, as determined by himself, for the argument $M_{Vict.}$; in case of Leiden, a correction necessary for the reason that in the computation of the magnitude equations as determined by the two observers, already contained in the communicated Right Ascensions, the constant magnitude 8·1 had been assumed for the planet throughout the period of the observations, June 16 to July 31.

The following reduction of the first observation in the Algiers series may serve as an example:—

Star α	Mag.	α obs.	red. to $8^m\cdot0$	δ obs.	Red. to $N_4(8^m)$	
		s	s	″	s	″
A	5·8	39·25	39·276	— ... 27·5	+ 0·16	+ 0·15
a	7·8	25·18	25·182	20·7	+ 0·01	— 0·13
c	8·5	6·14	6·134	5·1	+ 0·09	— 0·75
f	7·5	50·45	50·456	48·6	+ 0·04	— 0·33
i	7·7	41·09	41·094	1·7	+ 0·04	— 0·74
n	6·6	26·82	26·837	7·7	+ 0·05	+ 0·38
q	8·4	23·65	23·645	22·4	+ 0·02	+ 0·05
t	7·9	4·47	4·471	17·6	— 0·01	— 0·71
w	8·2	27·21	27·208	32·1	— 0·03	— 0·22
y	8·1	25·85	25·849	53·4	+ 0·02	— 0·49
γ	7·4	57·29	57·297	52·4	+ 0·02	+ 0·17
θ	8·4	23·76	23·755	58·1	+ 0·04	— 0·70
μ	6·5	8·79	8·808	12·7	+ 0·12	+ 0·11
			Mean from 13 stars ...	...	+ 0·044	— 0·25

The observed place of the planet is: $20^h\ 2^m\ 30^s\cdot47\ -10°\ 2'\ 47''\cdot8$, its computed magnitude 8·88; the reduction to $8^m\cdot0$, therefore, is $= -0^s\cdot011$ and the reduction for $8^m\cdot0$-stars $R_\alpha = +0^s\cdot044$ $R_\delta = -0''\cdot25$, making the total reduction for the Right Ascension of *Victoria* $= +0^s\cdot033$ and the place within the system N_4: $20^h\ 2^m\ 30^s\cdot503$ $-10°\ 2'\ 48''\cdot05$.

No distinction was made, in forming the mean R_α and R_δ, between the comparison

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stars proper and the "reference stars," though the latter, or generally the brighter among the stars, appear to be more accurately observed in some of the series. In determining the reduction applicable to the observation of the planet (which even when in opposition scarcely exceeded in brightness the faintest of the comparison stars), the greater weight which otherwise would be due to the bright stars in the determination of zero-points is in all probability wholly compensated by the greater effect of the difference of brightness between planet and star, because the co-efficients used in the magnitude equations are only more or less approximately known, and at the best are mean values only, while the actual value generally must be supposed to vary to some extent with the circumstances of the observation, and may have varied so considerably for some observers. Moreover, in some series several observers were employed, while a general mean only between their equations could be used.

The observations, from June to September, were first compared with the ephemeris computed in the office of the *Berliner Jahrbuch* by Hr. Lange and published in *Astr. Nach.* No. 2931. This ephemeris (Eph. A) was found to represent the observed Right Ascensions very nearly, differing from them by quantities which throughout the first three months remained between the limits $-0^s{\cdot}1$ and $-0^s{\cdot}15$, but it differed rather much from the observed Declinations, viz., by $-7''{\cdot}2$ at the beginning of June and by $-2''{\cdot}2$ at the end of August. New elements, therefore, were computed at the office, by Dr. Bohlin, so as best to represent 14 normals formed from the first comparison, extending from June 7 to September 19, and two more normals formed for October from the Pulkowa observations. From these new elements an ephemeris (Eph. B) was computed by Dr. Bohlin and extended over the period June 2—October 30, and by aid of this ephemeris a discussion of the whole mass of meridian observations was made in 1891. After that time however, when Dr. Gill's discussion of the heliometer observations had shown the necessity of a more refinedly computed ephemeris, the computation was made again by Dr. Bohlin, using eight-figure logarithms and deriving the Earth's co-ordinates, previously taken from the *Jahrbuch*, with greater accuracy. This new ephemeris (Eph. C) then has served in a final comparison of the meridian observations. Those computed places, however, were used again which had been interpolated from Eph. A, applying to them the amount of the difference Eph. C – Eph. A, which was tabulated for consecutive Berlin midnights and, regarding the character of the differences, had to be taken from the table, for the epoch of observation, by linear interpolation between the two including epochs.

The two ephemerides B and C are printed, under the designations "Ephemeris I" and "Ephemeris II," in Vol. I., pp. 249–250 and 441–444, but not to an extent sufficient for the comparison of all the meridian observations. The following supplementary tables, therefore, are printed here :—

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Eph. C – Eph. A.

Berlin midn.	Δα	Δδ	Δ log Δ	Berlin midn.	Δα	Δδ	Δ log Δ	Berlin midn.	Δα	Δδ	Δ log Δ	Berlin midn.	Δα	Δδ	Δ log Δ
	s	″			s	″			s	″			s	″	
June 2	+0·090	+ 7·24	+ 27·	Sept. 4	+0·086	+ 2·02	+ 34·	Sept. 13	+0·047	+ 1·66	+ 33	Sept. 22	+0·010	+ 1·32	+ 32
3	+0·096	+ 7·21	+ 28	5	+0·070	+ 1·97	+ 34	14	+0·037	+ 1·56	+ 33	23	+0·004	+ 1·32	+ 31
4	+0·106	+ 7·29	+ 28·	6	+0·064	+ 1·98	+ 33	15	+0·035	+ 1·51	+ 33	24	+0·001	+ 1·29	+ 31
5	+0·117	+ 7·34	+ 29	7	+0·060	+ 1·94	+ 34	16	+0·035·	+ 1·53	+ 32	25	—0·006	+ 1·28	+ 31
(Δ log Δ in units of 6th dec. place)				8	+0·060	+ 1·82	+ 34	17	+0·033	+ 1·54	+ 32·	26	—0·016	+ 1·19	+ 31
Aug. 31	+0·107	+ 2·23	+ 34·	9	+0·054	+ 1·80	+ 33	18	+0·022	+ 1·45	+ 32	27	—0·018	+ 1·16·	+ 31
Sept. 1	+0·102	+ 2·16	+ 34·	10	+0·057·	+ 1·74	+ 33	19	+0·016	+ 1·46	+ 32	28	—0·022	+ 1·06	+ 31
2	+0·097	+ 2·20	+ 35	11	+0·051	+ 1·68	+ 33	20	+0·019	+ 1·38	+ 32	29	—0·029	+ 1·02	+ 31
3	+0·090	+ 2·10	+ 35	12	+0·050	+ 1·67	+ 33	21	+0·016	+ 1·30	+ 32	30	—0·043	+ 0·98·	+ 30

Continuation of Eph. B.

Berlin midn.	App. R.A.	App. Dec.	Log Δ
	h m s	° ′ ″	
Sept. 30	19 52 32·777	—8 19 16·71·	0·100616
Oct. 1	53 50·316	21 26·33	0·104032
2	55 9·203	23 28·42	0·107443
3	56 29·407	25 22·87	0·110848
4	57 50·894	27 9·60	0·114247
5	59 13·632	28 48·52	0·117640
6	20 0 37·591	30 19·57·	0·121025
7	2 2·740	31 42·68·	0·124404
8	3 29·050	32 57·79	0·127775
9	4 56·495	34 4·84	0·131138
10	6 25·047	35 3·78	0·134493
11	7 54·681	35 54·55	0·137840
12	9 25·373	36 37·12	0·141178
13	10 57·099	37 11·42	0·144507
14	12 29·836	37 37·41	0·147827
15	14 3·561	37 55·04	0·151138
16	16 38·252	38 4·28	0·154439
17	17 13·887	38 5·09	0·157730
18	18 50·445	37 57·42	0·161011
19	20 27·904·	37 41·25	0·164281
20	22 6·245	37 16·54	0·167541
21	23 45·446	36 43·25	0·170790
22	25 25·486	36 1·37	0·174027
23	27 6·346	35 10·86	0·177253

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Berlin midn.	App. R.A.	App. Dec.	Log Δ
	h m s	° ′ ″	
Oct. 24	20 28 48·004	−8 34 11·69	0·180467
25	30 30·439	33 3·86	0·183668·
26	32 13·629	31 47·34	0·186858
27	33 57·552	30 22·14	0·190034
28	35 42·184	28 48·24	0·193198
29	37 27·502	27 5·67	0·196348·
30	39 13·484	25 14·43	0·199485·

Individual Observations, and Comparison with Ephemeris C.

Algiers.

1889	M.T.A.	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	h m s	° ′ ″	s	″		″ +	s	s	s	s	″	″	″	″
June 3	15 11 31	20 2 30·47	−10 2 47·8	+0·033	−0·25	13	6·29	30·444	+0·059	+0·047	+0·077	42·16	+0·40	+0·19	−0·32
4	15 7 48	2 42·99	9 52 25·4	+ 35	−0·46	15[1]	6·32	42·978	+0·047	+ 38	+ 65	19·95	+0·29	+0·07	−0·42
5	15 4 1	2 53·44	9 42 6·3	+ 6	−1·16	14	6·35	53·444	+0·002	− 4	+ 20	1·72	+0·61	+0·38	−0·09
19	14 7 48	1 42·42	7 28 1·9	− 78	+0·27	14	6·71	42·389	−0·047	− 32	− 43	55·41	+0·49	+0·06	−0·18
July 4	13 1 43	19 54 33·61	5 39 6·8	+ 23	−0·01	11	6·96	33·571	+0·062	+ 76	+ 80	1·12	+1·27	+0·46	+0·52
8	12 41 57	50 31·41	5 18 39·8	− 123:[2]	−0·98	11	7·00	31·130	[+0·157:]	...	...	34·49	+0·71	−0·22	−0·04
19	11 49 35	41 23·28	4 43 58·1	− 7	−0·50	3	7·00	23·357	−0·084	− 57	− 74	52·67	+1·07	+0·32	+0·23
25	11 21 7	36 29·10	4 38 35·2	+ 1	−0·70	15	6·95	29·650	−0·539[3]	− 5	− 22	29·48	+0·53	−0·27	−0·34
26	11 16 25	35 43·12	4 38 35·0	− 30	−1·25	11	6·94	43·144	−0·054	− 19	− 35	29·38	+0·07	−0·74	−0·80
29	11 2 2	...	4 40 0·9	...	−1·16	4	6·90	...	...	...	...	56·07	+0·91	+0·09	+0·06
Aug. 5	10 30 29	29 5·54	4 51 6·5	− 35	−0·36	9[4]	6·77	5·514	−0·009	+ 21	+ 18	1·60	+1·51	+0·76	+0·75
9	10 12 51	27 11·11	5 1 35·3	+ 10	−0·69	15	6·68	11·262	−0·142	− 120	− 120	30·33	+1·02	+0·34	+0·30
12	9 59 59	26 5·58	5 11 2·7	− 56	−1·59	13	6·60	5·585	−0·061	− 44	− 42	58·50	+0·81	+0·17	+0·12
20	9 27 7	24 41·40	5 41 24·7	− 37	−0·84	14	6·37	41·380	−0·017	− 8	+ 5	21·02	+1·85	+1·27	+1·25
22	9 19 15	24 42·93	5 49 51·8	+ 27	−1·55	13	6·31	41·997	−0·960[5]	− 31	− 15	47·25	+0·21	−0·36	−0·34

[1] For α, 16 stars; y excl. for δ. [2] Observations of R.A. unreliable owing to a fault in the chronograph.
[3] The obs. R.A. communicated as 29ˢ·10 probably contains a slip of the pen, and ought to be read 29ˢ·50, making Red. α — Eph. = — 0ˢ·139; v′ and v have been put down assuming this correction.
[4] For α, 10 stars, B excl. for δ. [5] The obs. R.A. needs the correction — 1ˢ, which has been applied in forming v′ and v.

The "number of stars" used to determine the day correction given in this and in the following tables is that of the stars used for Declination. Those used for R.A. happen to be more or less sometimes, by one or occasionally two; this is mentioned, in the footnotes, in such cases only when an observed Declination has been rejected for some doubt or a larger discordance.

The columns v' and v give the errors of the observations on two suppositions as to the necessary corrections of Eph. C, whose determination follows this synopsis.

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Berlin.

1889	Pos. Instr.	Obs. R.A.	No. of wires	Obs. Dec.	Div. read	Im.	Remarks
		h m s		° ′ ″			
June 7	IV	20 3 7·960	23	— 9 22 3·45	8	2–3	Daylight.
8	II	3 12·208 :	6	...	...	...	Clouds ; transits quite uncertain.
10	II	3 14·609	25	8 52 6·42	8	2–3	Illum. field and some daylight.
17	III	2 17·567	25	7 46 0·14	8	3–4	Field faintly illum. ; obs. difficult.
18	III	2 1·241	25	7 37 4·56	8	2–3	
20	I	1 22·672	25	7 19 40·91	12	3	Bright field.
21	I	1 0·438	25	7 11 14·72	8	2–3	do.
22	I	0 36·260	25	7 2 58·53	8	3	do.
24	IV	19 59 42·367	24	6 46 56·79 :	8	3	Undulating in δ. Obs. still difficult.
26	IV	58 41·275	25	6 31 42·86	12	2	Good obs.
July 31	II	32 8·060	25	4 42 9·36	8	2–3	
August 1	II	31 28·625	24	4 43 31·99	8	3	Faint and very diffused.
7	I	28 5·528	25	4 55 59·27	8	2–3	Good obs.
9	III	27 11·959	25	5 1 33·30	8	2	
16	I	25 6·801	15	5 25 23·02	8	2–3	Bright illum.
18	III	24 49·764	25	5 33 12·48	8	2	Hazy.
25	II	24 59·324	14	6 2 49·44	8	2–3	Illum. rather faint.
30	IV	26 12·994	25	6 25 8·38	8	3	do.
31	IV	26 34·332	25	6 29 37·65	8	2–3	Bright illum.
Sept. 15	III	36 3·149	25	7 32 54·09	8	2–3	do.
18	III	38 48·305	15	7 43 52·69	8	2–3	Rather hazy.

1889	Total Reduct.	No. st.	Par.	R.A. Eph. C	Red. α — Eph.	v′	v	Dec. Eph. C	Red. δ — Eph.	v′	v
	s ″		+ ″	s	s	s	s	″	″	″	″
June 7	—0·022 +0·05	15	7·84	7·977	—0·039	—0·038	—0·021	55·92	+0·36	+0·12	—0·32
8	— 15 —0·05	13	...	12·256	—0·063 :	— 60	— 45	...	...	...	...
10	— 15 —0·01	12	7·97	14·573	+0·021	+ 29	+ 39	58·77	+0·31	+0·03	—0·35
17	— 9 0·00	12	8·26	17·577	—0·019	— 3	— 12	51·91	+0·03	—0·36	—0·63
18	— 18 —0·08	17	8·30	1·260	—0·037	— 22	— 31	56·61	+0·27	—0·14	—0·39
20	— 18 +0·04	16	8·38	22·650	+0·004	+ 18	+ 7	33·58	+1·09	+0·64	+0·41
21	— 19 +0·03	15	8·41	0·408	+0·011	+ 24	+ 14	6·67	+0·39	—0·07	—0·30
22	— 13 —0·10	11	8·45	36·250	—0·003	+ 10	0	50·05	—0·13	—0·62	—0·83
24	— 26 +0·11	13	8·51	42·345	—0·004	+ 8	— 1	49·24	+1·07 :	+0·53	+0·35
26	— 23 —0·06	11	8·58	41·283	—0·031	— 20	— 25	34·34	0·00	—0·59	—0·73
July 31	— 12 —0·11	10	8·73	8·041	+0·007	+ 44	+ 34	1·05	+0·31	—0·50	—0·52
Aug. 1	— 21 +0·03	16	8·71	28·623	—0·019	+ 17	+ 9	24·05	+0·80	—0·01	—0·02
7	— 9 —0·02	15	8·53	5·535	—0·016	+ 10	+ 9	51·59	+0·83	+0·11	+0·09
9	— 17 +0·06	14	8·46	11·980	—0·038	— 16	— 16	25·31	+0·53	—0·15	—0·19
16	— 14 —0·01	11	8·20	6·771	+0·016	+ 27	+ 34	15·59	+0·76	+0·16	+0·10
18	— 17 —0·09	11	8·12	49·769	—0·022	— 12	— 2	4·60	+0·15	—0·44	—0·48
25	— 15 —0·11	13	7·81	59·361	—0·052	— 40	— 24	42·54	+0·80	+0·26	+0·33
30	— 16 —0·03	17	7·57	12·996	—0·018	— 1	+ 12	1·02	+0·18	—0·31	—0·14
31	— 22 —0·09	10	7·52	34·361	—0·051	— 33	— 21	30·09	—0·13	—0·60	—0·42
Sept. 15	— 8 —0·17	12	6·79	3·155	—0·014			47·01	—0·46		
18	— 22 —0·11	15	6·64	48·318	—0·035			45·67	—0·49		

This beautiful series unfortunately was interrupted between June 26 and July 31, the observer being absent for a holiday.

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Cambridge (Eng.).

1889	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α — Eph.	τ	v	Dec. Eph. C	Red. δ — Eph.	τ′	v
	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 25	19 59 11·66	—6 38 58·67	—0·080	+1·51	8	8·52	11·554	+0·026	+0·038	+0·031	48·96	+0·32	—0·25	—0·41
26	58 40·32	6 31 26·34	— 212	+0·51	10	8·55	40·090	+0·018	+ 29	+ 24	17·90	+0·62	+0·03	—0·11
27	58 7·25	6 24 8·77	— 137	+1·29	10	8·58	6·944	+0·169	+ 180	+ 176	59·04	+0·14	—0·48	—0·60
July 5	52 49·19	5 33 38·07	— 90	+1·14	16	8·77	49·066	+0·034	+ 48	+ 52	29·41	+1·25	+0·41	+0·50
11	48 5·69	5 6 3·99	— 95	+1·27	15	8·85	5·526	+0·069	+ 87	+ 85	53·85	—0·02	—0·99	—0·78
18	42 13·50	4 45 51·51	— 133	+1·33	8	8·88	13·394	—0·027	— 2	— 18	40·84	—0·46	—1·21	—1·29
23	38 4·71	4 39 23·73	— 27	+0·77	12	8·84	4·756	—0·073	— 40	— 59	14·73	+0·61	—0·16	—0·26
30	32 47·58	4 41 2·98	— 156	+1·17	6	8·72	47·329	+0·095	+ 132	+ 121	53·49	+0·50	—0·32	—0·34
Aug. 3	30 12·94	4 47 1·15	— 82	+1·60	11	8·63	12·982	—0·124	— 90	— 95	51·52	+0·60	—0·19	—0·19
5	29 5·25	4 51 12·14	— 32	+1·37	11	8·57	5·251	—0·033	— 3	— 6	2·75	+0·55	—0·20	—0·21
6	28 34·09	4 53 34·07	— 80	+1·40	11	8·54	33·967	+0·043	+ 71	+ 69	24·87	+0·74	+0·01	—0·01
15	25 17·99	5 21 47·04	— 63	+1·22	11	8·21	18·009	—0·082	— 70	— 64	38·05	+0·44	—0·17	—0·23
17	24 56·87	5 29 26·01	— 177	+1·82	5	8·13	56·881	—0·188	— 178	— 169	16·01	—0·05	—0·65	—0·72
29	25 54·51	6 20 51·07	— 36	+1·14	8	7·59	54·497	—0·023	— 7	+ 7	41·82	—0·52	—1·02	—0·87

Cambridge (Mass.).

1889	Obs. R.A.	Geoc. δ from obs.	Hour Angle α	Hour Angle δ	Total Reduct.		No. st.	(Par.)	R.A. Eph. C	Red. α — Eph.	v′	τ	Dec. Eph. C	Red. δ —Eph.	v′	v
	h m s	° ′ ″	s	s	s	″		+ ″	s	s	s	s	″	″	″	″
June 22	20 0 30·35	—7 0 53·4	+ 6	—14	—0·028	+0·03	17	7·45	30·303	+0·019	+0·032	+0·022	55·06	+1·69	+1·19	+0·99
29	19 56 48·48	6 8 37·0	+13	— 2	— 39	—0·56	17	7·60	48·472	—0·031	— 20	— 20	39·35	+1·79	+1·11	+1·04
July 15	44 35·31	4 52 11·5	+ 7	—13	— 63	—0·58	13	7·76	35·293	—0·046	— 26	— 36	11·98	—0·10	—0·94	—0·89
18	42 3·42	4 45 16·3	+ 7	—18	— 34	—0·13	13	7·75	3·393	—0·007	+ 18	+ 2	18·02	+1·59	+0·84	+0·76
21	39 33·15	4 40 47·1	+ 7	—12	— 51	—0·26	13	7·74	33·110	—0·011	+ 19	0	48·36	+1·00	+0·25	+0·14
22	38 43·84	4 39 49·8	+13	— 6	— 74	—0·69	8	7·73	43·845	—0·079	— 47	— 67	50·10	—0·39	—1·15	—1·25
Aug. 6	28 28·01	4 53 54·1	+ 6	—14	— 89	—0·18	8	7·46	27·988	—0·067	— 39	— 41	54·21	—0·07	—0·80	—0·82
20[1]	24 41·19	5 42 9·4	+11	— 7	— (77)	(—0·17)		7·02	41·052	+0·061	+ 70	+ 83	12·48	+2·91	+2·33	+2·31
21[2]	24 40·73	5 46 23·6	+14	— 2	— (78)	,,		6·98	40·710	—0·058	— 49	— 35	24·56	+0·79	+0·22	+0·21
22	24 42·62	5 50 39·7	+17	+ 7	— (78)	,,		6·94	42·583	—0·041	— 31	— 16	40·27	+0·40	—0·16	—0·15
28	25 40·69	6 17 4·0	+17	+10	— (80)	,,		6·72	40·650	—0·040	— 24	— 10	6·00	+1·83	+1·32	+1·45
30[3]	26 17·79	6 26 5·0	+17	+ 4	— (81)	,,		6·64	17·820	—0·111	— 93	— 81	4·22	—0·95	—1·44	—1·30

[1] Obs. of *Victoria* doubtful. [2] Rather doubtful. [3] Rather uncertain.

After August 6, no more comparison stars were observed. The numbers given under the heading "Total Reduction" for the last five days are the observer's mean reductions for $8^{m}\cdot0$-stars, combined with the reduction to $8^{m}\cdot0$ for the observed R.A. of

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the planet. For sake of distinctness such values are included in ( ) in this and the following tables.

Cape of Good Hope.

1889	Obs.	M.T.C.	Obs. R.A.	Geoc. δ from obs.	Total Reduct.	No. st.	(Par.)	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s	h m s	° ′ ″	s ″		″	s	s	s	s	″	″	″	″
June 3	P	15 11 41	20 2 30·01	−10 3 9·25	−0·086 +0·66	9	3·48	29·850	+0·074	+0·062	+0·092	8·86	+0·27	+0·06	−0·45
5	P	15 4 12	2 53·18	9 42 29·93	− 100 +1·54	10	3·58	53·039	+0·041	+ 35	+ 59	28·09	−0·30	−0·53	−1·00
7	P	14 56 35	3 8·03	9 22 4·73	− 103 +0·68	13	3·67	7·902	+0·025	+ 26	+ 43	4·50	+0·45	+0·21	−0·23
8	M	14 52 44	3 12·33	9 11 59·82	− 151 +0·17	12	3·73	12·210	−0·031	− 28	− 13	59·96	+0·31	+0·06	−0·36
10	M	14 44 54	3 14·64	8 52 6·64	− 66 +0·23	11	3·83	14·586	−0·012	− 4	+ 6	7·12	+0·71	+0·43	+0·05
13	P	14 32 54	3 2·73	8 23 4·25	− 90 +1·09	6	3·98	2·601	+0·039	+ 54	+ 53	3·55	+0·39	+0·07	−0·25
15	P	14 24 44	2 44·35	8 4 15·46	− 104 +0·48	11	4·08	44·291	−0·045	− 30	− 35	15·88	+0·90	+0·55	+0·25
17	P	14 16 26	2 17·83	7 45 59·04	− 72 −0·06	13	4·18	17·793	−0·035	− 19	− 28	59·54	+0·44	+0·05	−0·22
18	C	14 12 14	2 1·41	7 37 3·05	+ 29 +0·10	10	4·23	1·504	−0·065	− 50	− 59	4·09	+1·14	+0·73	+0·48
21	P	13 59 26	1 0·75	7 11 14·24	− 38 +0·51	13	4·37	0·735	−0·023	− 10	− 20	13·76	+0·03	−0·43	−0·66
22	C	13 55 6	0 36·64	7 2 56·58	− 20 +0·49	10	4·42	36·605	+0·015	+ 28	+ 18	56·99	+0·90	+0·41	+0·20
26	C	13 37 27	19 58 41·72	6 31 39·67	− 27 +0·05	10	4·59	41·737	−0·044	− 33	− 38	40·62	+1·00	+0·41	+0·27
27	P	13 32 58	58 8·65	6 24 20·58	− 37 −0·21	11	4·63	8·676	−0·063	− 52	− 56	21·16	+0·37	−0·25	−0·37
28	C	13 28 28	57 34·04	6 17 13·05	− 40 −0·22	11	4·67	33·988	+0·012	+ 23	+ 21	14·26	+0·99	+0·34	+0·24
29	P	13 23 56	56 57·75	6 10 20·11	− 62 +0·27	13	4·71	57·735	−0·047	− 36	− 37	20·33	+0·49	−0·19	−0·26
July 1	C	13 14 47	55 40·86	5 57 12·24	− 81 +0·21	11	4·78	4·814	−0·035	− 23	− 22	12·56	+0·53	−0·20	−0·22
2	P	13 10 11	55 0·33	5 50 59·38	− 116 +0·26	11	4·82	0·276	−0·062	− 50	− 47	59·37	+0·25	−0·50	−0·50
3	C	13 5 33	54 18·52	5 44 59·96	− 32 +0·13	11	4·85	18·470	+0·018	+ 31	+ 35	0·35	+0·52	−0·26	−0·23
4	P	13 0 55	53 35·56	5 39 15·40	− 127 +0·19	11	4·88	35·466	−0·033	− 19	− 15	15·76	+0·55	−0·26	−0·20
5	C	12 56 15	52 51·42	5 33 44·89	− 52 +0·09	12	4·91	51·347	+0·021	+ 35	+ 39	45·86	+1·06	+0·22	+0·31
17	M	11 59 21	43 6·70	4 47 53·00	− 117 +0·50	10	5·14	6·590	−0·007	+ 16	+ 2	52·73	+0·23	−0·55	−0·58
18	P	11 54 34	42 15·97	4 45 48·61	− 21 +0·48	12	5·15	15·974	−0·025	0	− 16	46·83	−1·30	[−2·06]	−2·11
19	M	11 49 48	41 25·58	4 43 56·37	− 113 +0·62	11	5·15	25·512	−0·045	− 18	− 35	57·02	+1·27	+0·52	+0·43
20	P	11 45 2	40 35·33	4 42 23·21	− 85 +0·55	11	5·15	35·304	−0·059	− 30	− 49	23·21	+0·55	−0·19	−0·30
22	C	11 35 31	38 56·04	4 40 2·72	− 41 +0·26	12	5·15	56·061	−0·062	− 31	− 50	3·11	+0·65	−0·10	−0·22
23	M	11 30 47	38 7·27	4 39 16·05	− 54 +0·10	11	5·15	7·231	−0·015	+ 17	− 1	16·70	+0·75	−0·01	−0·12
24	C	11 26 3	37 19·06	4 38 45·12	− 32 +0·15	11	5·14	19·064	−0·036	− 3	− 21	45·67	+0·70	−0·08	−0·17
25	M	11 21 19	36 31·77	4 38 29·13	− 155 +0·39	9	5·14	31·659	−0·044	− 10	− 27	29·88	+1·14	+0·34	+0·27
26	C	11 16 37	35 45·07	4 38 28·68	− 36 +0·29	11	5·13	45·115	−0·081	− 46	− 62	29·08	+0·69	−0·12	−0·18
27	M	11 11 56	34 59·62	4 38 42·31	− 98 +0·25	11	5·12	59·527	−0·005	+ 31	+ 16	43·04	+0·98	+0·17	+0·12
30	C	10 56 58	31 49·41	4 40 49·88	− 24 +0·54	5	5·08	49·475	−0·089	− 52	− 63	50·20	+0·86	+0·04	+0·02
Aug. 1	M	10 48 46	31 29·22	4 43 21·83	− 141 +0·68	11	5·04	29·169	−0·090	− 54	− 62	22·73	+1·58	+0·77	+0·76
2	C	10 44 12	30 51·05	4 44 58·54	− 14 +0·73	3	5·02	51·209	−0·173	− 137	− 144	58·12	+0·31	−0·49	−0·49
5	C	10 30 41	29 6·89	4 50 54·79	− 46 +0·06	9	4·95	6·895	−0·051	− 21	− 24	55·77	+1·04	+0·29	+0·28
6	M	10 26 14	28 35·60	4 53 17·08	− 87 +0·47	11	4·93	35·521	−0·008	+ 20	+ 18	17·37	+0·76	+0·03	+0·01
7	C	10 21 48	28 5·87	4 55 48·23	− 21 −0·11	10	4·90	5·940	−0·091	− 65	− 66	49·38	+1·04	+0·32	+0·30

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1889	Obs.	M.T.C.	Obs. R.A.	Geoc. δ from obs.	Total Reduct.	No. st.	(Par.)	R.A. Eph.C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s	h m s	° ′ ″	s ″		″	s	s	s	s	″	″	″	″
Aug. 9	C	10 13 3	19 27 12·33	— 5 1 22·40	—0·005 +0·20	9	4·84	12·332	—0·007	+0·015	+0·015	22·83	+0·63	—0·05	—0·09
10	M	10 8 43	26 48·56	5 4 23·10	— 115 +0·19	8	4·81	48·387	+0·058	+ 78	+ 79	23·39	+0·48	—0·18	—0·23
12	M	10 0 10	26 6·50	5 10 48·72	— 72 +0·10	10	4·75	6·403	+0·025	+ 42	+ 44	49·92	+1·30	+0·66	+0·61
14	M	9 51 44	25 32·55	5 17 46·43	— 120 +0·05	10	4·68	32·504	—0·074	— 61	— 56	47·41	+1·03	+0·41	+0·35
16	M	9 43 27	25 7·08	5 25 11·61	— 206 +0·59	10	4·61	6·921	—0·047	— 36	— 29	12·36	+1·34	+0·74	+0·68
19	C	9 31 17	24 44·60	5 37 2·81	— 41 —0·30	8	4·50	44·575	—0·016	— 7	+ 5	3·49	+0·38	—0·21	—0·24
20	M	9 27 18	24 41·70	5 41 10·07	— 132 +0·56	9	4·46	41·479	+0·089	+ 98	+ 111	10·39	+0·88	+0·30	+0·28
22	M	9 19 26	24 42·03	5 49 36·50	— 65 +0·08	8	4·38	41·909	+0·056	+ 65	+ 81	36·30	—0·12	—0·69	—0·67
23	P	9 15 34	24 45·54	5 53 53·27	— 62 +0·19	12	4·34	45·451	+0·027	+ 37	+ 53	54·43	+1·35	+0·79	+0·82
27	P	9 0 27	25 22·02	6 11 31·85	— 88 +0·48	10	4·19	21·948	—0·016	— 2	+ 14	31·16	—0·21	—0·74	—0·62
28	M	8 56 45	25 36·81	6 16 2·00	— 192 +0·78	8	4·15	36·651	—0·033	— 18	— 3	59·27	—1·95	[—2·46]	—2·33

Some mistake must have been made in the readings for Declination July 18 and August 28, probably in the reading of the telescope-micrometer; the reductions were found correct upon examination, but the error of the resulting Declinations far surpasses anything which possibly could be attributed to accidental error of observation in this very accurate series. The two Declinations, therefore, ought to be excluded.

Cincinnati.

1889	M.T.C.	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
							+								
	h m s	h m s	° ′ ″	s	″		″	s	s	s	s	″	″	″	″
July 11	12 26 35	19 47 53·94	— 5 5 6·5	—0·026	+0·25	17	7·34	53·944	—0·030	—0·012	—0·015	0·48	+1·57	+0·60	+0·81
13	12 17 4	46 14·44	4 58 8·2	— 65	+1·07	17	7·34	14·293	+0·082	+ 101	+ 94	1·24	+1·45	+0·51	+0·68
15	12 7 32	44 33·41	4 52 14·2	+ 40	+0·89	16	7·34	33·432	+0·018	+ 39	+ 28	5·97	0·00	—0·84	—0·79
22	11 34 10	38 42·11	4 39 55·8	— 90	+0·35	16	7·31	42·048	—0·028	+ 4	— 16	48·23	+0·09	—0·67	—0·78
27	11 10 36	34 46·82	4 38 56·4	— 72	+0·94	12	7·25	46·691	+0·057	+ 93	+ 79	49·67	+1·46	+0·65	+0·60
31	10 52 3	31 57·18	4 42 28·3	— 71	+0·36	16	7·18	57·468	—0·359[1]	+ 77	+ 68	21·74	+0·98	+0·17	+0·15
Aug. 10	10 7 30	26 42·00	5 5 22·7	— 58	+0·49	11	6·96	41·904	+0·038	+ 58	+ 59	16·56	+1·31	+0·65	+0·60
24	9 10 38	24 53·22	5 59 37·4	(— 73)	(+0·47)[2]	...	6·51	53·287	—0·140	— 128	— 113	30·45	+0·03	—0·51	—0·47

[1] There seems to be a slip of the pen in the communicated R.A., which probably ought to be read 57ˢ·58, making Red. obs. — Eph. = + 0ˢ·041. This correction has been adopted in cols. v′ and v.

[2] Mean of all day corrections obtained for obs. Circle E.

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Cordoba.

1889	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph.C	Red. α / Eph.	r′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	° ′ ″	s	″		″	s	s	s	s	″	″	″	″
July 2	19 54 50·91	−5 49 30·5	(−0·123)	(−0·41)		4·42	50·787	0·000	+0·012	+0·016	35·66	+0·33	−0·43	−0·42
3[1]	54 8·84	5 43 35·2	,,	,,		4·46	8·698	+0·019	+ 32	+ 36	39·93	−0·14	−0·92	−0·90
4[2]	53 25·56	5 37 53·7	,,	,,		4·49	25·434	+0·003	+ 17	+ 21	58·70	+0·10	−0·71	−0·65
5[3]	52 41·24	5 32 26·0	,,	,,		4·51	41·038	+0·079	+ 93	+ 97	31·98	+1·06	+0·21	+0·31
13	46 17·20	4 58 5·9	− (122)	,,		4·69	17·110	−0·032	− 13	− 19	12·14	+1·14	+0·20	+0·37
15	44 36·27	4 52 9·4	− 128	−0·60	(1)	4·71	36·274	−0·132	− 112	− 122	15·09	+0·38	−0·46	−0·41
16	43 45·70	4 49 34·3	− 122	(−0·41)		4·72	45·628	−0·050	− 28	− 41	40·68	+1·25	+0·45	+0·44
17	42 55·06	4 47 17·2	− 139	+0·05	(3)	4·73	54·962	−0·041	− 17	− 32	22·39	+0·51	−0·26	−0·31
18[3]	42 4·51	4 45 14·9	− 142	−0·30	(3)	4·74	4·372	−0·004	+ 21	+ 5	20·19	+0·25	−0·50	−0·58
19[4]	41 14·05	4 43 26·6	− 100	−1·02	(3)	4·74	13·957	−0·007	+ 20	+ 3	34·08	+1·72:	+0·97	+0·88
20	40 23·88	4 41 58·1	− 146	−0·45	4	4·74	23·822	−0·088	− 59	− 78	3·90	+0·61	−0·13	−0·24
22[5]	38 44·89	4 39 43·6	− 144	−1·31	(3)	4·74	44·798	−0·052	− 20	− 40	51·06	+1·41	+0·65	+0·54
25	36 20·94	4 38 23·6	− 55	+0·15	4	4·73	20·892	−0·007	+ 28	+ 10	28·37	+0·19	−0·61	−0·68
29	33 21·88	4 39 59·9	− 111	+0·06	(2)	4·69	21·813	−0·044	− 7	− 19	5·67	+1·14	+0·32	+0·29
30	32 40·10	4 40 59·0	− 143	−0·85	(2)	4·67	39·951	+0·006	+ 43	+ 32	5·08	+0·56	−0·26	−0·28
Aug. 1	31 20·40	4 43 37·7	− 149	−0·39	(3)	4·64	20·319	−0·068	− 32	− 40	43·53	+1·58	+0·77	+0·77
2	30 42·85	4 45 16·7	− 98	−0·11	(2)	4·62	42·713	+0·039	+ 74	+ 68	21·75	+0·54	−0·26	−0·26
3	30 6·73	4 47 6·9	− 121	−0·34	(2)	4·59	6·664	−0·055	− 21	− 26	12·08	+0·93	+0·15	+0·14
5	28 59·71	4 51 22·2	− 124	−0·39	(2)	4·55	59·536	+0·050	+ 80	+ 77	27·34	+0·20	−0·55	−0·56
18	24 48·55	5 33 50·2	− 181	+0·34	(2)	4·16	48·452	−0·083	− 74	− 63	56·40	+2·38	+1·79	+1·76
19	24 43·75	5 37 53·7	− 166	−0·76	4	4·12	43·671	−0·087	− 78	− 66	59·78	+1·20	+0·62	+0·58
22	24 42·63	5 50 30·4	− 162	−0·22	4	4·01	42·525	−0·057	− 47	− 32	35·28	+0·65	+0·09	+0·10
24	24 53·01	5 59 10·6	− 107	−0·43	5	3·94	52·867	+0·027	+ 39	+ 54	15·68	+0·71	+0·17	+0·21
27[6]	25 25·25	6 12 29·9	− 118	+0·06	5	3·83	25·128	+0·004	+ 19	+ 34	32·64	+0·97:	+0·45	+0·56
28	25 40·50	6 16 56·9	− 165	+0·35	5	3·79	40·342	−0·007	+ 9	+ 23	0·94	+0·60	+0·09	+0·22
29	25 57·94	6 21 25·3	− 107	+0·41	4	3·75	57·774	+0·063	+ 80	+ 93	29·87	+1·23	+0·73	+0·88

[1] Faint; poor obs. [2] Through light clouds. [3] Unsteady. [4] Dec. doubtful. [5] Much haze.

The number of comparison stars observed with the planet always is small in this series; when it was less than four, the reduction employed is a mean from the observed day correction and the observer's general reduction, with relative weights 1:2, 1:1, 2:1, respectively, according to the number of comparison stars observed 1, 2, 3.

To distinguish the values obtained from a combination of the special and the mean reduction, the "number of stars" is included in ( ) in such cases in the tables.

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Dublin.

1889	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
July 3 [1]	19 54 15·66	−5 44 45·6	−0·136	+0·07	11	8·85	15·545	−0·021	−0·008	−0·004	36·13	−0·55	−1·33	−1·30
29 [2]	33 28·78	4 40 5·9	− 89	−0·08	11	8·86	28·658	+0·033	+ 70	+ 58	57·39	+0·27	−0·55	−0·58
Aug. 17	24 56·71	5 29 28·9	− 100	+0·88	11	8·24	56·731	−0·121	− 111	− 102	20·21	+0·43	−0·17	−0·22
20 [3]	24 41·65	5 41 35·1	− 35	−0·15	11	8·11	41·348	+0·267	+ 276	+ 289	27·57	+0·43	−0·15	−0·17

[1] Very very faint; dark field. [2] Faint; bright field. [3] Dark field; through clouds.

Greenwich.

1889	Obs.	M.T.Gr.	Obs. R.A.	Geoc. δ from obs.	Total Reduct.		No. st.	(Par.)	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
July 5	H	12 56 1	19 52 49·40	−5 33 27·45	−0·059	+0·63	(2)	8·70	49·055	+0·286	+0·300	+0·304	29·33	+2·51	+1·67	+1·76
15	T	12 8 39	44 45·32	4 52 45·41	− 83	+2·23	7	8·80	45·287	−0·050	− 30	− 40	44·29	+1·11	+0·26	+0·32
18	JP	11 54 20	42 13·44	4 45 39·72	− 83	+0·82	11	8·80	13·381	−0·024	+ 1	− 15	40·81	+1·91	+1·16	+1·08
19	WR	11 49 34	41 22·93	4 43 52·02	− 37	+0·07	7	8·79	22·928	−0·035	− 8	− 25	51·81	−0·14	−0·89	−0·98
23	T	11 30 32	38 4·79	4 39 13·41	− 45	+0·28	8	8·76	4·743	+0·002	+ 35	+ 16	14·72	+1·59	+0·82	+0·72
25	H	11 21 5	36 29·23	4 38 29·49	+ 30	+0·74	9	8·74	29·250	+0·010	+ 45	+ 27	29·47	+0·72	−0·08	−0·15
29	H	11 2 22	33 29·61	4 39 56·80	− 49	+2·36	4	8·67	29·409	+0·152	+ 189	+ 177	56·51	+2·07	+1·25	+1·22
30	AD	10 57 44	32 47·26	4 40 54·59	− 21	+1·71	12	8·65	47·318	−0·079	− 42	− 53	53·51	+0·63	−0·19	−0·21
31	T	10 53 8	32 6·68	4 42 4·83	− 108	+1·75	11	8·63	6·549	+0·023	+ 60	+ 50	3·90	+0·82	+0·01	−0·01
Aug. 6	H	10 26 0	28 34·11	4 53 25·75	− 64	+0·13	7	8·46	33·959	+0·087	+ 115	+ 113	24·91	−0·71	−1·44	−1·46
7	JP	10 21 35	28 4·59	4 55 57·51	− 30	+0·94	7	8·43	4·471	+0·089	+ 115	+ 114	57·44	+0·87	+0·15	+0·13
15	JP	9 47 22	25 18·16	5 21 39·55	− 86	+0·71	12	8·14	18·005	+0·069	+ 81	+ 87	38·11	−0·73	−1·34	−1·40
17	WR	9 39 9	24 57·14	5 29 16·57	+ 24	+0·79	10	8·06	56·878	+0·286	+ 296	+ 305	16·07	+0·29	−0·31	−0·36
28	T	8 56 34	25 37·49	6 16 13·34	− 51	+1·15	11	7·58	37·466	−0·027	− 12	+ 3	13·05	+0·86	+0·35	+0·48
29	AP	8 52 55	25 54·68	6 20 42·62	− 93	+1·50	11	7·53	54·503	+0·084	+ 100	+ 114	41·89	+0·77	+0·27	+0·42

The communicated geocentric Declinations already imply the R − D correction, which had not been applied to the communicated Declinations of the stars. Due allowance for this difference has been made in determining the day corrections.

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Hamburg.

1889	M.T.H.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 22	13 54 59	20 0 36·22	— 7 2 53·9	—0·074	—0·26	8	8·54	36·012	+0·134	+0·147	+0·137	45·38	—0·24	—0·73	—0·94
24	13 46 14	19 59 42·01	6 46 54·9	+ 20	+0·36	6	8·59	42·070	—0·040	— 28	— 37	44·79	—1·16	—1·70	—1·88
25	13 41 48	59 12·23	6 39 8·8	+ 42	+2·02	4	8·64	12·393	—0·121	— 109	— 116	1·50	+3·36	+2·79	+2·63
July 26	11 16 30	35 43·99	4 38 40·0	— 36	+1·04	(3)	8·94	44·027	—0·073	— 38	— 54	29·24	—0·78	—1·59	—1·65
27	11 11 49	34 58·11	4 38 52·3	— 3	+0·21	7	8·92	58·463	—0·356	— 320	— 335	43·55	+0·38	—0·43	—0·48
31	10 53 15	32 7·55	4 42 9·8	+ 76	+0·99	6	8·83	7·660	—0·034	+ 3	— 7	1·78	+1·80	+0·99	—0·97

Mt. Hamilton.

1889	M.T. Mt.H.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 9	14 47 18	20 3 14·81	— 8 58 16·2	—0·088	+0·58	10	6·54	14·740	—0·018	—0·011	0·000	8·98	—0·10	—0·37	—0·76
13	14 31 20	2 59·69	8 19 28·7	— 58	+0·34	11	6·64	59·682	—0·050	— 35	— 37	21·78	+0·06	—0·26	—0·58
16	14 18 59	2 26·83	7 50 37·3	— 123	+0·52	8	6·72	26·749	—0·042	— 26	— 34	30·82	+0·76	+0·38	+0·11
17	14 14 48	2 11·77	7 42 36·9	— 79	+0·38	9	6·75	11·692	—0·001	+ 14	+ 5	30·06	+0·29	—0·11	+0·37
18	14 10 35	1 54·68	7 33 45·2	— 99	+0·46	9	6·77	54·622	—0·041	— 26	— 36	38·11	+0·14	—0·28	—0·52
19	14 6 20	1 35·57	7 25 4·8	— 67	+0·21	8	6·80	35·562	—0·059	— 44	— 55	55·38	—2·41	[—2·85]	—3·08
21	13 57 44	0 51·60	7 8 25·9	— 55	+0·66	11	6·84	51·567	—0·022	— 9	— 19	59·15	+0·75	+0·28	+0·05
23	13 49 1	0 0·00	6 51 51·9	— 67	+0·68	10	6·88	59·972	—0·039	— 27	— 36	44·66	+0·32	—0·20	—0·39
24	13 44 37	19 59 31·51	6 44 1·2	— 104	+0·93	12	6·90	31·424	—0·018	— 6	— 14	54·05	+0·68	+0·13	—0·04
July 4	12 59 6	53 18·42	5 37 12·8	— 64	+0·65	8	7·05	18·422	—0·066	— 52	— 48	5·60	+0·50	—0·32	—0·25
7	12 45 2	51 2·00	5 21 44·9	— 146	+0·62	7	7·07	1·929	—0·075	— 59	— 56	38·37	+1·16	+0·24	+0·41
8	12 40 19	50 14·70	5 17 6·7	— 55	+0·59	4	7·08	14·669	—0·024	— 8	— 5	59·71	+0·68	—0·26	—0·07

It has been assumed that the communicated Declinations of *Victoria* were read on the fixed circle alone, while for the stars readings of both circles were given. If the planet, too, had been observed on both circles, the day corrections used would require the further correction $+0''\cdot07$, making the mean of the v' exactly zero (excluding the Declination of June 19, which apparently has been vitiated by some error of reading, or by a displacement of the telescope, and cannot be used).

It is much to be regretted that this exceedingly fine series was discontinued after July 8, when the stars were understood to have been sufficiently observed.

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Königsberg.

1889	Obs. R.A. and No. of wires		Obs. Dec.	Total Reduct.		No. st.	Par.	R.A. Eph.C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. α / Eph.	v′	v
	h m s		° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 22	20 0 37·07	14	−7 3 9·43	−0·315	+0·19	7	8·66	36·745	+0·010	+0·023	+0·013	59·73	−0·85	−1·34	−1·55
23	0 11·30	15	6 55 0·77	− 325	+0·32	8	8·67	10·747	+0·228	+ 240	+ 231	53·59	+1·81	+1·30	+1·10
24	19 59 43·37	...	6 47 4·73	− 352	+0·27	9	8·71	42·910	+0·108	+ 120	+ 111	58·50	+2·75	+2·21	+2·03
26	58 42·39	15	...	− 338	...	10	...	41·918	+0·134	+ 145	+ 140	...	...	...	...
29	56 58·34	22	6 10 34·21	− 364	−0·17	10	8·86	57·942	+0·034	+ 45	+ 44	22·60	−2·92	−3·60	−3·67
30[1]	56 20·53	20	6 3 51·14	− 370	+0·12	9	8·89	20·200	−0·040	− 29	− 28	41·85	−0·28	−0·98	−1·03
July 9	49 46·01	24	5 14 25·19	− 315	+0·16	9	9·07	45·708	−0·013	+ 3	+ 5	18·60	+2·64	+1·69	+1·89
11	48 8·59	23	5 6 10·36	− 313	+0·01	9	9·10	8·318	−0·041	− 24	− 25	6·79	+5·54	[+4·57]	+4·78
25	36 32·25	25	4 38 39·17	− 366	−0·22	6	9·06	31·923	−0·039	− 5	− 22	29·92	−0·41	−1·21	−1·28
Aug. 1	31 29·60	23	4 43 31·03	− 310	+0·52	9	8·92	29·386	−0·096	− 60	− 68	22·22	+0·63	−0·18	−0·19
5	29 7·38	20	4 51 2·94	− 276	+0·19	10	8·80	7·076	+0·028	+ 58	+ 55	55·02	+1·07	+0·32	+0·31
19	24 44·87	18	5 37 8·92	− 349	−0·17	6	8·27	44·598	−0·077	− 68	− 56	2·12	+1·30	+0·71	+0·68

[1] Very faint.

The Declinations of this series being of very inferior accuracy throughout, only the one value most in error for July 11 must be supposed to be affected with some extraordinary mistake, and consequently has been excluded from the determination of the error of the ephemeris.

Leiden.

1889	Obs.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. α / Eph.	v′	v
		h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 16	B	20 2 31·620	−7 54 50·48	−0·113	+0·37	15	8·20	31·543	−0·036	−0·020	−0·027	42·29	+0·38	+0·01	−0·27
18	„	2 0·900	7 36 51·07	− 95	+0·47	14	8·28	0·830	−0·025	− 10	− 19	43·45	+1·13	+0·72	+0·47
19	„	1 42·518	7 28 5·07	− 76	+0·51	15	8·31	42·465	−0·023	− 8	− 19	57·46	+1·21	+0·78	+0·54
20	„	1 22·208	7 19 28·62	− 82	+0·31	13	8·35	22·122	+0·004	+ 18	+ 7	20·90	+0·94	+0·49	+0·26
23	„	0 9·687	6 54 40·70	− 89	+0·74	15	8·45	9·548	+0·050	+ 62	+ 53	32·22	+0·71	+0·20	0·00
25	„	19 59 11·983	6 39 3·11	− 63	+0·38	14	8·52	11·927	−0·007	+ 5	− 2	54·54	+0·33	−0·24	−0·40
26	„	58 40·557	6 31 31·99	− 65	+0·75	15	8·55	40·484	+0·008	+ 19	+ 14	23·31	+0·62	+0·03	−0·11
July 3	„	54 16·886	5 44 55·28	− 93	+0·79	15	8·73	16·822	−0·029	− 16	− 12	46·68	+0·92	+0·14	+0·17
4	„	53 33·800	5 39 10·98	− 65	+0·57	13	8·75	33·773	−0·038	− 24	− 20	2·67	+1·01	+0·20	+0·26
5	„	52 49·660	5 33 42·10	− 53	+0·49	15	8·77	49·612	−0·005	+ 9	+ 13	33·34	+0·50	−0·34	−0·25
29	„	33 30·031	4 40 4·60	− 87	+0·14	10	8·74	29·942	+0·002	+ 39	+ 27	55·88	+0·16	−0·66	−0·69
30	W	32 47·806	4 41 0·32	− 62	+0·24	12	8·72	47·834	−0·090	− 53	− 64	52·72	+1·36	+0·54	+0·52
31	B	32 7·067	4 42 11·02	− 45	+0·48	14	8·70	7·049	−0·027	+ 10	0	2·95	+1·11	+0·30	+0·28

The observed Right Ascensions, as communicated, contain a constant correction $-0^s{\cdot}083$ for obs. B, and the correction $-0^s{\cdot}057$ for obs. W, all computed with mag. 8·1 of the planet. The necessary special corrections of these assumptions are included in the "total reduction."

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Leipzig.

1889	Pos. Ins.	Obs. R.A.	Wires	Obs. Dec.	Pointings	Total Reduct.	No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s		° ′ ″		s ″		+ ′	s	s	s	s	″	″	″	″
June 7	W	20 3 8·07	9	−9 22 1·12	2	−0·020 − 0·56	27	7·75	7·992	+0·058	+0·059	+0·076	54·24	+0·31	+0·07	−0·37
17	W	2 17·59	15	7 45 57·00	2	− 65 − 0·62	20	8·16	17·534	−0·009	+ 6	− 2	50·40	+0·94	+0·55	+0·28
21[1]	E	1 0·46	15	7 11 13·44	2	− 51 − 0·34	(2)	8·31	0·343	+0·066	+ 79	+ 69	5·26	−0·21	−0·67	−0·90
22	E	0 36·22	9	7 2 56·30	2	− 55 + 0·21	12	8·34	36·180	−0·015	− 2	− 12	48·67	+0·92	+0·43	+0·22
23	E	0 10·22	15	6 54 50·48	2	− 62 − 0·39	18	8·38	10·141	+0·017	+ 29	+ 20	42·77	+0·28	−0·23	−0·43
25	E	19 59 12·66	14	6 39 13·12	2	− 36 + 0·02	10	8·44	12·598	+0·026	+ 38	+ 31	4·57	−0·09	−0·66	−0·82
26	W	58 41·28	15	6 31 41·22	2	− 41 − 0·08	16	8·47	41·193	+0·046	+ 57	+ 52	33·09	+0·26	−0·33	−0·47
27	W	58 8·13	15	6 24 21·59	2	− 28 + 0·09	12	8·50	8·104	−0·002	+ 9	+ 5	13·83	+0·83	+0·21	+0·09
28[1]	W	57 33·51	15	6 17 14·57	2	− 59 − 0·58	5	8·53	33·388	+0·063	+ 74	+ 72	7·17	+0·55	−0·10	−0·19
30[1]	W	56 19·40	14	6 3 40·79	2	− 39 − 0·06	7	8·58	19·334	+0·027	+ 38	+ 39	32·99	+0·72	+0·02	−0·03
July 2	W	54 59·60	12	5 51 0·79	2	− 36 + 0·16	5	8·62	59·579	−0·015	− 3	0	53·19	+1·18	+0·43	+0·43
5	W	52 50·56	15	5 33 47·31	2	− 54 + 0·10	4	8·69	50·592	−0·086	− 72	− 68	40·41	+1·89	+1·05	+1·14
6	W	52 5·42	5	5 28 32·95	1	− 36 − 0·32	5	8·70	5·428	−0·044	− 29	− 25	25·67	+1·10	+0·23	+0·35
7	W	51 19·29	2	5 23 34·69	1[2]	− 47 − 0·10	(2)	8·72	19·321	−0·078	− 62	− 59	26·01	−0·06	−0·97	−0·81
9	W	49 44·64	15	5 14 19·86	2	− 62 − 0·08	4	8·74	44·626	−0·048	− 31	− 30	12·71	+1·51	+0·56	+0·76
10	W	48 56·22	14	5 10 6·87	2	− 4 − 0·10	4	8·75	56·214	+0·002	+ 19	+ 19	59·35	+1·13	+0·16	+0·38
11	W	48 7·28	10	5 6 10·22	3	− 46 + 0·52	4	8·76	7·209	+0·025	+ 43	+ 41	1·68	+0·74	−0·23	−0·02
15	W	44 47·12	12	4 52 57·82	1	− 69 + 0·20	4	8·79	47·032	+0·019	+ 39	+ 29	50·02	+1·19	+0·34	+0·40
24	E	37 18·30	12	4 38 53·26	3	− 48 − 0·13	10	8·74	18·256	−0·004	+ 29	+ 11	45·31	+0·66	−0·12	−0·21
28	E	34 14·28	16	4 39 19·71	1	− 46 + 0·06	(3)	8·67	14·250	−0·016	+ 21	+ 7	12·04	+1·06	+0·25	+0·20
30	E	32 48·85	12	4 40 59·28	3	− 40 − 0·14	(3)	8·63	48·744	+0·066	+ 103	+ 92	51·33	+0·54	−0·28	+0·30
31	E	32 8·09	12	4 42 8·91	3	− 77 − 0·04	11	8·61	7·929	+0·084	+ 121	+ 111	1·27	+0·93	+0·12	+0·10
Aug. 1	E	31 28·67	11	4 43 32·10	3	− 72 + 0·04	4	8·59	28·515	+0·083	+ 119	+ 111	24·25	+0·78	−0·03	−0·04
10[1]	W	26 48·03	17	5 4 33·76	1	− (52)−(0·17)		8·32	48·000	−0·022	− 2	− 1	26·50	+0·89	+0·23	+0·18
12	W	26 6·14	8	5 11 1·00	2	„ „		8·25	6·082	+0·006	+ 23	+ 25	53·32	+0·40	−0·24	−0·29
16	E	25 6·83	10	5 25 23·49	2	− (53) „		8·09	6·741	+0·036	+ 47	+ 54	16·24	+0·67	+0·07	+0·01
18	E	24 49·87	8	5 33 11·66	1	− 46 + 0·10	6	8·01	49·751	+0·073	+ 83	+ 93	5·27	+1·72	+1·13	+1·09
20	E	24 41·56	10	5 41 21·42	2	− (53)−(0·17)		7·93	41·446	+0·061	+ 70	+ 83	14·60	+0·94	+0·36	+0·34
25	W	24 59·40	12	6 2 50·34	3	− 32 − 0·20	8	7·70	59·386	−0·018	− 6	+ 10	43·27	+0·43	−0·11	−0·04
27	W	25 22·21	12	6 11 41·87	3	− 58 − 0·08	(1)	7·60	22·177	−0·025	− 11	+ 4	35·68	+1·33	+0·80	+0·92
29	W	25 53·89	12	6 20 40·00	3	− 61 − 0·04	5	7·52	53·879	−0·050	− 34	− 20	32·64	+0·12	−0·38	−0·23
30	E	26 13·00	11	6 25 9·32	3	− 44 + 0·07	9	7·47	13·053	−0·097	− 80	− 67	1·77	−0·01	−0·50	−0·33
31	W	26 34·34	8	6 29 36·78	3	− 51 − 0·09	(1)	7·42	34·424	−0·135	− 117	− 105	30·84	+1·39	+0·92	+1·10
Sept. 1	W	26 58·10	9	6 34 6·10	3	− (55)−(0·17)		7·38	57·976	+0·069			59·42	+0·53		
2	W	27 23·79	12	6 38 34·25	3	− 59 − 0·14	(1)	7·33	23·691	+0·040			27·19	+0·13		
3	W	27 51·43	11	6 43 0·62	3	− (55)−(0·17)		7·28	51·548	−0·173			53·44	−0·07		
4	W	28 21·64	12	6 47 25·73	3	„ „		7·23	21·521	+0·064			18·72	+0·05		

[1] Very faint. [2] Hasty.

The small difference (E. − W. = +0ˢ·017), which appears to exist between the Right Ascensions observed in the opposite positions of the instrument, has been neglected, when the general reduction was used for want or insufficient number of stars.

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Melbourne.

1889	Obs.	Obs. R.A.	Obs. Dec.	Pointings	Hour Angle	Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s	° ′ ″		s	s	″		″	s	s	s	s	″	″	″	″
July 4	S	19 53 50·688	−5 41 9·64	2	+ 9	−0·034	+0·16	9	5·48	50·708	−0·054	−0·041	−0·036	15·15	+0·19	−0·61	−0·56
5	I	53 6·932	5 35 32·57	2	...	− 83	−1·40	15	5·51	6·977	−0·128	− 114	− 110	40·13	+0·65	−0·18	−0·10
6	P	52 22·286	5 30 13·53	2	...	− 51	−0·75	9	5·54	22·177	+0·058	+ 72	+ 77	19·87	+0·05	−0·81	−0·70
9	P	50 2·300	5 15 43·44	2	+14	+ 5	−0·89	12	5·62	2·288	+0·017	+ 33	+ 35	49·90	−0·05	−1·00	−0·80
18	P	42 33·772	4 46 20·87	2	...	+ 11	−1·62	14	5·76	33·750	+0·033	+ 57	+ 42	29·23	+0·98	+0·23	+0·16
20	I	40 52·963	4 42 46·37	2	...	− 19	−1·51	12	5·77	52·911	+0·033	+ 61	+ 43	54·36	+0·70	−0·04	−0·15
23	I	38 24·351	4 39 23·33	2	...	− 60	−1·18	13	5·77	24·320	−0·029	+ 3	− 16	31·22	+0·94	+0·18	+0·07
26	I	36 1·422	4 38 20·00	1	...	− 17	−1·25	12	5·75	1·368	+0·037	+ 62	+ 55	27·67	+0·67	−0·14	−0·20
Aug. 5	P	29 18·243	4 50 1·90	1	+ 9	− 40	−0·78	10	5·56	18·336	−0·133	− 102	− 106	8·60	+0·46	−0·30	−0·31
8	P	27 47·661	4 57 25·58	1	+ 9	+ 18	−0·97	9	5·47	47·732	−0·053	− 28	− 29	33·33	+1·31	+0·60	+0·58
21	S	24 40·578	...	...	...	+ 32	...	5	...	40·634	−0·024	− 15	− 1	...	...	...	...

One more observation was reported from Melbourne, July 15, but found to belong to a fixed star (−4°4950).

Naples.

1889	Observed Place			Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s		° ′ ″	s	″		+	s	s	s	s	″	″	″	″
June 7	20 3 8·020		−9 22 3·54	−0·030	−0·48	10	6·83	7·961	+0·029	+0·030	+0·047	57·71	+0·52	+0·28	−0·16
8	3 12·185		9 11 59·09	+ 28	−0·59	8	6·87	12·250	−0·037	− 34	− 19	52·48	−0·33	−0·58	−1·00
13	4 2·462		8 23 2·93	+ 23	−1·09	8	7·02	2·513	−0·028	− 13	− 14	56·46	−0·54	−0·86	−1·18
17	2 17·663		7 45 59·40	− 40	−0·92	10	7·14	17·613	+0·010	+ 25	+ 17	53·19	+0·01	−0·38	−0·65
18	2 1·313		7 37 2·23	+ 1	−1·33	11	7·17	1·301	+0·013	+ 28	+ 19	57·87	+1·48	+1·07	+0·82
19	1 43·000		7 28 17·49	− 20	−0·35	8	7·19	42·989	−0·009	+ 6	− 5	11·61	+0·96	+0·53	+0·29
20	1 22·697		7 19 41·03	− 8	−0·42	10	7·22	22·700	−0·011	+ 3	− 8	34·79	+0·56	+0·11	−0·12
21	1 0·389		7 11 13·37	− 15	−0·55	11	7·25	0·463	−0·089	− 76	− 86	7·86	+1·19	+0·73	+0·50
22	0 36·282		7 2 57·94	+ 16	−0·54	9	7·27	36·311	−0·013	0	− 10	51·22	+0·01	−0·48	−0·69
23	0 10·304		6 54 51·40	+ 10	−0·31	10	7·29	10·280	+0·034	+ 46	+ 37	45·26	+0·84	+0·33	+0·13
25	19 59 12·770		6 39 13·21	− 13	−0·05	10	7·34	12·755	+0·002	+ 14	+ 7	6·94	+1·02	+0·45	+0·29
26	58 41·353		6 31 42·38	+ 17	+0·18	9	7·36	41·359	+0·011	+ 22	+ 17	35·39	+0·55	−0·04	−0·18
July 1	55 40·238		5 57 13·79	+ 30	−1·46	10	7·45	40·340	−0·072	− 60	− 59	8·10	+0·30	−0·43	−0·45
4	53 54·931		5 39 18·27	+ 21	−0·36	11	7·50	34·944	+0·008	+ 22	+ 26	11·72	+0·59	−0·22	−0·16
5	52 50·800		5 33 47·14	+ 13	−0·81	8	7·51	50·823	−0·010	+ 4	+ 8	42·08	+1·64	+0·80	+0·89
6	52 5·637		5 28 33·47	+ 3	−0·63	9	7·52	5·664	−0·024	− 9	− 5	27·26	+0·68	−0·19	−0·07
8	50 32·606		5 18 49·29	− 4	−0·89	10	7·54	32·601	+0·001	+ 17	+ 20	43·08	+0·44	−0·49	−0·31
9	49 44·838		5 14 20·32	+ 15	−0·56	7	7·55	44·874	−0·021	− 4	− 3	14·05	+0·72	−0·23	−0·03
11	48 7·422		5 6 9·00	+ 18	−0·16	10	7·56	7·464	−0·024	− 6	− 8	2·87	+1·27	+0·30	+0·51
12	47 17·926		5 2 27·73	+ 35	−0·29	11	7·56	17·957	+0·004	+ 22	+ 18	20·95	+0·49	−0·48	−0·27
13	46 27·994		4 59 1·29	+ 23	−0·35	12	7·57	28·032	−0·015	+ 4	− 2	54·89	+0·82	−0·12	+0·05
14	45 37·747		4 55 50·70	+ 22	−0·38	11	7·57	37·780	−0·011	+ 8	0	44·87	+1·36	+0·46	+0·58
15	44 47·254		4 52 57·07	+ 37	−0·93	10	7·57	47·294	−0·003	+ 17	+ 7	50·87	+0·24	−0·62	−0·55

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1889	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
	h m s	° ′ ″	s	″			s	s	s	s	″	″	″	″
July 16	19 43 56·621	−4 50 19·36	+0·003	−0·72	9	7·57	56·667	−0·043	−0·021	−0·034	12·96	+0·45	−0·36	−0·35
18	42 15·337	4 45 52·67	+ 41	+0·86	12	7·56	15·382	−0·004	+ 21	+ 5	45·45	+1·20	+0·44	+0·37
21	39 44·756	4 41 12·96	− 2	+0·81	11	7·55	44·871	−0·117	− 87	− 106	4·49	−0·11	−0·85	−0·96
22	38 55·418	4 40 10·49	+ 20	+1·38	9	7·54	55·485	−0·047	− 16	− 35	2·47	+0·90	+0·15	+0·04
23	38 6·623	4 39 24·64	+ 24	+1·72	8	7·53	6·662	−0·015	+ 17	− 1	16·24	+0·85	+0·09	−0·02
24	37 18·420	4 38 52·02	+ 20	+0·74	11	7·52	18·504	−0·064	− 31	− 49	45·39	+1·63	+0·85	+0·76
25	36 31·042	4 38 37·98	+ 19	+0·86	10	7·51	31·108	−0·047	− 13	− 30	29·78	+0·17	−0·63	−0·70
26	35 44·468	4 38 36·93	+ 49	+1·59	6	7·50	44·574	−0·057	− 22	− 38	29·17	+1·33	+0·52	+0·46
29	33 31·064	4 40 2·89	+ 7	+1·73	11	7·45	31·102	−0·031	+ 6	− 6	54·54	+0·83	+0·01	−0·02
31	32 8·106	4 42 8·86	+ 28	+1·68	12	7·41	8·136	−0·002	+ 35	+ 25	0·87	+1·10	+0·29	+0·27
Aug. 1	31 28·668	4 43 32·13	+ 8	+1·52	11	7·40	28·715	−0·039	− 3	− 11	23·78	+0·57	−0·24	−0·25
2	30 50·708	4 45 7·36	+ 19	+1·53	12	7·37	50·773	−0·046	− 10	− 17	59·31	+0·85	+0·05	+0·05
3	30 14·349	4 46 54·21	0	+1·47	5	7·35	14·379	−0·030	+ 4	− 1	47·04	+1·65	+0·86	+0·86
4	29 39·559	4 48 54·85	+ 26	+1·64	11	7·33	39·608	−0·023	+ 9	+ 5	46·55	+0·67	−0·10	−0·11
5	29 6·408	4 51 4·90	+ 26	+1·65	12	7·31	6·516	−0·082	− 52	− 55	57·39	+1·45	+0·70	+0·69
6	28 35·119	4 53 27·43	− 2	+1·91	6	7·28	35·163	−0·046	− 18	− 20	19·10	+0·86	+0·13	+0·11
7	28 5·558	4 55 59·71	+ 21	+1·94	11	7·26	5·598	−0·019	+ 7	+ 6	51·26	+0·75	+0·03	+0·01
9	27 12·018	5 1 33·61	− 3	+1·66	8	7·20	12·039	−0·024	− 2	− 2	24·90	+0·15	−0·53	−0·57
11	26 26·097	5 7 43·43	+ 7	+1·22	11	7·15	26·154	−0·050	− 32	− 30	34·83	−0·23	−0·88	−0·93
16	25 6·789	5 25 22·72	+ 31	+0·96	9	6·99	6·796	+0·024	+ 35	+ 42	15·04	+0·27	−0·33	−0·39
17	24 57·204	5 29 15·27	− 20	+1·81	9	6·96	57·213	−0·029	− 19	− 10	6·78	+0·28	−0·32	−0·37
18	24 49·782	5 33 12·04	− 2	+2·18	11	6·93	49·783	−0·003	+ 7	+ 17	4·03	+1·10	+0·51	+0·47
19	24 44·484	5 37 14·70	+ 14	+1·34	7	6·90	44·526	−0·028	− 19	− 7	6·35	−0·11	−0·70	−0·73
23	24 45·438	5 54 5·31	+ 21	+1·26	8	6·75	45·507	−0·048	− 38	− 22	57·52	+0·22	−0·34	−0·31
25	24 59·240	6 2 49·13	+ 52	+1·14	9	6·68	59·339	−0·047	− 35	− 20	41·90	+0·59	+0·05	+0·12

Oxford (Radcliffe Observatory).

1889	Obs.	M.T.O.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v′	v	Dec. Eph. C	Red. δ / Eph.	v′	v
		h m s	h m s	° ′ ″	s	″		+	s	s	s	s	″	″	″	″
June 25[1]	FB	13 41 40	19 59 11·31	−6 38 55·14	+0·009	+0·30	5	8·48	11·438	−0·119	−0·107	−0·114	47·24	+0·88	+0·31	+0·15
26	R	13 37 13	58 39·91	6 31 24·23	+ 2	+0·03	9	8·51	39·969	−0·057	− 46	− 51	16·22	+0·53	−0·06	−0·20
July 5	R	12 55 59	52 48·77	5 33 35·32	+ 63	−0·36	8	8·73	48·899	−0·066	− 52	− 48	28·21	+1·26	+0·42	−0·33
10[2]	R	12 32 26	48 54·37	5 9 59·63	− 27	+1·45	6	8·80	54·368	−0·025	− 8	− 8	50·06	+0·68	−0·29	−0·07
18[3]	FB	11 54 18	42 13·19	4 45 47·68	+ 17	−0·49	5	8·83	13·204	+0·003	+ 28	+ 37	40·40	+1·06	+0·31	+0·23
23	R	11 30 31	38 4·55	4 39 23·76	− 8	+0·41	5	8·79	4·573	−0·031	+ 2	− 17	14·59	+0·03	−0·74	−0·84
27[4]	FB	11 11 40	34 56·99	4 38 51·48	+ 65	+0·15	4	8·74	57·060	−0·005	+ 31	+ 16	44·22	+1·63	+0·82	+0·77
29	W	11 2 21	33 29·26	4 40 6·33	+ 1	+1·47	6	8·70	29·260	+0·001	+ 38	+ 26	56·68	+0·52	−0·30	−0·33
Aug. 3	FB	10 39 26	30 12·90	4 47 0·87	− 22	+0·65	4	8·58	12·849	+0·029	+ 63	+ 58	51·95	+0·31	−0·48	−0·48
5	FB	10 30 26	29 5·24	4 51 11·99	− 70	+0·45	3	8·52	5·129	+0·041	+ 71	+ 69	3·27	+0·25	−0·50	−0·51
6	R	10 25 59	28 33·82	4 53 34·07	− 13	+0·85	3	8·49	33·852	−0·045	− 17	− 19	25·43	+0·70	−0·03	−0·05
15[5]	FB	9 47 20	25 17·87	5 21 46·48	+ 51	+0·42	4	8·17	17·961	−0·040	− 28	− 22	38·89	+1·00	+0·39	+0·33
17[6]	FB	9 39 8	24 56·84	5 29 24·01	− 7	−0·54	5	8·09	56·849	−0·016	− 6	+ 3	16·89	+0·43	−0·17	−0·22
29	FB	8 52 54	25 54·51	6 20 49·87	− 5	+0·68	4	7·55	54·566	−0·061	− 45	− 31	42·83	+1·19	+0·69	+0·84

[1] Very faint; hazy. [2] Good. [3] Very faint; bad definition. Obs. in dark field. [4] Very faint; diffused.
[5] Faint. [6] Faint. Obs. in dark field.

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Paris.

1889	Obs.	M.T.P.	Obs. R.A.	Geoc. δ from obs.	Total Reduct.	No. st.	(Par.)	R.A. Eph. C	Red. α / Eph.	r′	r	Dec. Eph. C	Red. δ / Eph.	v′	r
I.—Grand Instrument Méridien.															
		h m s	h m s	° ′ ″	″ ″		+	″	″	″	″	″	″	″	″
June 14	H	14 28 39	20 2 54·16	−8 13 8·7	+0·053 +0·49	4	7·83	54·061	+0·154	+0·169	+0·166	10·74	+2·53	+2·20	+1·89
21	C	13 59 14	0 59·72	7 10 51·5	+ 44 +0·20	12	8·08	59·694	+0·075	+ 88	+ 78	51·26	−0·04	−0·50	−0·73
23	C	13 50 32	0 9·11	6 54 27·8	+ 99 −0·55	11	8·14	9·387	−0·175	− 163	− 172	29·36	+1·01	+0·50	+0·30
25	C	13 41 43	19 59 11·69	6 38 50·1	+ 182 −0·97	9	8·20	11·744	+0·131	+ 143	+ 136	51·81	+0·74	+0·17	+0·01
29	C	13 23 43	56 55·85	6 10 0·9	+ 124 −0·55	11	8·31	56·075	−0·107	− 96	− 101	2·08	+0·63	−0·05	−0·12
July 2	C	13 9 59	54 58·45	5 50 41·8	+ 24 −0·41	10	8·37	58·429	+0·072	+ 84	+ 87	42·97	+0·76	+0·01	+0·01
3	C	13 5 21	54 16·33	5 44 43·4	+ 53 −0·54	10	8·39	16·568	−0·184	− 171	− 167	44·59	+0·65	−0·13	−0·10
5	C	12 56 2	52 49·10	5 33 29·9	+ 125 −0·23	11	8·43	49·345	−0·119	− 105	− 101	31·42	+1·29	+0·45	+0·54
6	C	12 51 21	52 4·17	5 28 15·5	+ 91 −0·40	10	8·45	4·153	+0·129	+ 144	+ 148	17·10	+1·20	+0·33	+0·45
12	Bq	12 22 59	47 16·42	5 2 10·9	− 13 −0·49	7	8·51	16·310	+0·095	+ 113	+ 109	13·87	+2·48	+1·51	+1·72
17	Bq	11 59 8	43 4·22	4 47 44·1	+ 57 −1·49	9	8·52	4·322	−0·047	− 24	− 38	46·74	+1·15	+0·38	+0·33
29	Ba	11 2 24	33 29·63	4 39 56·5	+ 77 +0·01	12	8·39	29·687	+0·023	+ 60	+ 48	56·18	−0·31	−1·13	−1·16
30	Ba	10 57 46	32 47·52	4 40 52·1	+ 92 −0·11	13	8·37	47·587	+0·028	+ 65	+ 54	53·10	+0·89	+0·07	+0·05
31	Ba	10 53 9	32 6·69	4 42 3·0	− 16 +0·07	13	8·35	6·810	−0·124	− 87	− 97	3·41	+0·48	−0·33	−0·35
Aug. 2	Ba	10 44 0	30 49·58	4 45 1·5	− 50 −0·67	12	8·30	49·545	−0·013	+ 23	+ 16	2·68	+0·51	−0·29	−0·29
10	Ba	10 8 32	26 47·57	5 4 31·6	− 40: −0·7	(2)	8·07	47·360	+0·170:	+ 190	+ 191	31·67	−0·63	−1·29	−1·34
16	Bq	9 43 16	25 6·56	5 25 20·6	+ 12 −1·18	9	7·85	6·445	+0·100	+ 111	+ 118	22·63	+0·85	+0·25	+0·19
22	C	9 19 16	24 42·00	5 49 47·1	+ 76 −0·31	12	7·61	42·020	+0·062	+ 71	+ 87	47·80	+0·39	−0·18	−0·16
26	C	9 4 0	25 10·07	6 7 15·3	+ 10 −0·04	11	7·44	9·985	+0·091	+ 104	+ 120	16·13	+0·79	+0·25	+0·35
28	C	8 56 35	25 37·31	6 16 11·0	− 5 −0·15	11	7·35	37·363	−0·057	− 42	− 27	11·30	+0·15	−0·36	−0·23
29	C	8 52 57	25 54·35	6 20 39·4	+ 39 −0·21	9	7·31	54·384	+0·007	+ 23	+ 37	40·14	+0·53	+0·03	+0·18
II.—Cercle du Jardin.															
		h m s	h m s	° ′ ″	″ ″		+	″	″	″	″	″	″	″	″
July 2	R	13 9 58	19 54 58·25	−5 50 41·2	+0·051 −0·30	8	8·37	58·429	−0·130	−0·118	−0·115	42·97	+1·47	+0·72	+0·72
3	R	13 5 21	54 16·53	5 44 42·0	+ 10 −0·47	8	8·39	16·568	−0·032	− 19	− 15	44·59	+2·12	+1·34	+1·37
5	R	12 56 2	52 49·41	5 33 28·9	− 37 −0·58	9	8·43	49·345	+0·026	+ 40	+ 44	31·42	+1·94	+1·10	+1·19
6	R	12 51 21	52 4·24	5 28 15·5	− 3 −0·70	9	8·45	4·153	+0·081	+ 96	+ 100	17·10	+0·90	+0·03	+0·15
12	R	12 22 59	47 16·29	5 2 12·2	+ 19 −0·32	10	8·51	16·310	0·000	+ 18	+ 14	13·87	+1·35	+0·38	+0·59
17	R	11 59 8	43 4·27	4 47 45·2	+ 35 −0·41	8	8·52	4·322	−0·020	+ 3	− 11	46·74	+1·13	+0·36	+0·31
29	R	11 2 24	33 29·69	4 39 54·0	− 17 −0·87	13	8·39	29·687	−0·016	+ 21	+ 9	56·18	+1·31	+0·49	+0·46
30	R	10 57 46	32 47·64	4 40 51·5	− 11 −1·02	13	8·37	47·587	+0·041	+ 78	+ 67	53·10	+0·58	−0·24	−0·26
31	R	10 53 9	32 6·71	4 42 2·2	− 16 −0·39	12	8·35	6·810	−0·115	− 78	− 88	3·41	+0·82	+0·01	−0·01
Aug 2	R	10 44 0	30 49·53	4 45 0·7	+ 10 −1·21	14	8·30	49·545	−0·006	+ 30	+ 23	2·68	+0·77	−0·03	−0·03
3	R	10 39 28	30 13·18	4 46 49·7	− 7 −0·36	11	8·28	13·204	−0·032	+ 2	− 3	50·81	+0·75	−0·04	−0·04
7	R	10 21 36	28 4·54	4 55 55·5	+ 56 −0·98	13	8·17	4·657	−0·062	− 36	− 37	56·42	−0·06	−0·78	−0·80
10	R	10 8 32	26 47·27	5 4 31·6	+ 29 +0·18	6	8·07	47·360	−0·069	− 49	− 48	31·67	+0·25	−0·41	−0·46
13	R	9 55 44	25 47·56	5 14 23·8	+ 60 −0·02	5	7·97	47·670	−0·053	− 38	− 71	24·37	+0·55	−0·08	−0·14

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Pulkowa.

1889	M.T.P.	Obs. R.A. and No. wires	Obs. Dec.	Total Reduct.	No. st.	Par.	R.A. Eph. C	Red. α — Eph.	v′	v	Dec. Eph. C	Red. δ — Eph.	v′	v
	h m s	h m s	° ′ ″	s ″		+ ″	s	s	s	s	″	″	″	″
July 5[1]	12 56 24	19 52 52·82 6	−5 34 5·75	+0·065 +0·02	11	9·42	52·817	+0·068	+0·082	+0·086	56·49	+0·18	−0·66	−0·57
8	12 42 18	50 34·66 6	5 19 3·17	+ 68 −0·26	10	9·48	34·715	+0·013	+ 29	+ 32	55·44	+1·49	+0·56	+0·74
10	12 32 51	48 58·53 7	5 10 19·53	+ 38 +0·35	12	9·51	58·640	−0·072	− 55	− 55	11·61	+1·94	+0·98	+1·19
11	12 28 6	48 9·69 7	5 6 23·29	+ 75 +0·61	8	9·52	9·663	+0·102	+ 119	+ 119	13·16	0·00	−0·97	−0·76
14[2]	12 13 49	45 39·65 2	4 56 (3·5)	+ 53 +0·80	9	9·55	40·030	−0·330	− 311	− 319	53·02	−0·13	−1·04	−0·91
15	12 9 3	44 49·48 6	4 53 8·05	+ 8 −0·71	7	9·55	49·551	−0·063	− 43	− 53	58·30	−0·91	−1·77	−1·70
19	11 59 57	41 27·03 7	4 44 8·58	+ 92 +0·58	12	9·55	27·169	−0·047	− 20	− 37	0·38	+1·93	+1·18	+1·09
20[3]	11 45 12	40 36·97 7	4 42 32·39	+ 58 −0·41	11	9·55	36·950	+0·078	+ 107	+ 88	26·04	+2·79	+2·05	+1·94
21	11 40 26	39 46·94 6	4 41 15·99	+ 96 −0·30	10	9·54	47·086	−0·050	− 20	− 39	7·61	+0·86	+0·12	+0·01
23	11 30 56	38 8·67 7	4 39 26·86	+ 96 +0·22	12	9·52	8·829	−0·063	− 31	− 49	17·97	+0·85	+0·09	−0·02
30	10 58 7	32 50·79 8	4 40 56·91	+ 68 +1·28	11	9·40	50·813	+0·045	+ 82	+ 71	48·18	+1·95	+1·13	+1·11
Aug. 2	10 44 22	30 52·21 8	4 45 3·62	+ 94 +0·63	13	9·32	52·434	−0·130	− 94	− 101	54·77	+1·10	+0·30	+0·30
4	10 35 19	29 40·99 7	4 48 49·19	+ 155 −0·01	10	9·26	41·126	+0·019	+ 51	+ 48	40·97	+1·03	+0·26	+0·25
8	10 17 33	27 39·08 8	4 58 35·71	+ 22 +0·52	11	9·12	39·077	+0·025	+ 49	+ 49	25·85	−0·22	−0·92	−0·95
9	10 13 12	27 13·07 8	5 1 24·88	+ 118 +0·71	12	9·08	13·150	+0·038	+ 61	+ 60	17·04	+1·95	+1·27	+1·23
11	10 4 34	26 26·95 8	5 7 35·28	+ 169 +0·74	11	9·01	27·093	+0·026	+ 44	+ 46	26·20	+0·67	+0·02	−0·03
13	9 56 4	25 48·81 7	5 14 17·17	+ 30 +0·57	12	8·92	48·986	−0·146	− 131	− 128	8·15	+0·47	−0·16	−0·22
17	9 39 29	24 57·68 8	5 29 4·68	+ 28 −0·25	11	8·74	57·594	+0·114	+ 124	+ 133	56·33	+0·14	−0·46	−0·51
19	9 31 25	24 44·63 8	5 37 4·00	+ 55 +0·92	9	8·65	44·714	−0·029	− 20	− 8	55·44	+1·01	+0·42	+0·39
20[4]	9 27 26	24 41·59 3	5 41 12·06	+ 16 +0·45	11	8·60	41·546	+0·060	+ 69	+ 82	2·19	−0·82	−1·40	−1·42
22	9 19 34	24 41·87 8	5 49 32·89	+ 13 +1·09	9	8·50	41·829	+0·054	+ 63	+ 79	27·86	+4·56	[+3·99]	+4·01
27	9 0 34	25 21·43 8	6 11 31·31	+ 41 +0·55	(5)	8·25	21·502	−0·031	− 17	− 1	22·35	−0·16	−0·69	−0·57
28	8 56 52	25 35·98 8	6 15 57·01	+ 58 +0·92	10	8·20	36·133	−0·095	− 80	− 65	50·42	+2·53	+2·01	+2·15
29	8 53 13	25 52·87 8	6 20 27·85	+ 36 +1·08	11	8·14	52·983	−0·077	− 61	− 47	19·24	+0·61	+0·11	+0·26
Sept. 2[5]	8 38 58	27 22·25 7	6 38 19·07	+ 33 +0·14	10	7·93	22·359	−0·076			13·88	+2·88		
3	8 35 31	27 50·11 5	6 42 48·30	− 6 +0·52	12	7·88	50·100	+0·004			40·48	+0·58		
5	8 28 40	28 51·81 5	6 51 35·68	+ 84 +0·70	12	7·77	51·943	−0·049			28·78	+1·57		
7	8 21 59	30 1·94 7	7 0 15·66	− 9 +0·07	7	7·66	2·040	−0·109			8·41	+0·48		
15	7 56 29	36 0·49 7	7 32 41·28	+ 67 +0·26	11	7·24	0·692	−0·135			36·34	+2·56		
18	7 47 26	38 45·64 7	7 43 42·72	+ 64 +1·07	10	7·08	45·607	+0·097			35·71	+1·14		
22[6]	7 35 46	42 49·94 7	7 57 7·37	+ 42 +0·40	9	6·87	49·525	+0·457			59·36	−0·74		
24[7]	7 30 5	45 1·25 7	8 3 11·77	− 5 +0·66	6	6·76	1·313	−0·068			5·30	+0·95		
28[8]	10 38 39	49 53·83	8 14 24·86	(+ 55)(+0·39)		6·37	53·695	+0·375			18·92	+0·82		
Oct. 2[8]	8 51 34	54 54·44	8 23 15·68	(+ 47) „		6·31	54·490	+0·099			6·39	−2·59		
3	7 5 47	56 8·59 7	8 24 59·92	− 71 +0·36	5	6·32	8·530	−0·011			53·99	+0·75		
4	7 3 12	57 29·44 7	8 26 49·55	+ 32 +0·60	(3)	6·27	29·535	−0·063			42·53	−0·15		
5	7 0 39	58 51·99 7	8 28 29·14	+ 35 +0·49	(2)	6·22	51·797	+0·228			23·32	+0·89		
14	6 38 25	20 12 4·10 5	8 37 35·82	(+ 56)(+0·39)		5·82	3·916	+0·240			31·02	+1·41		
17	6 31 19	16 46·76 7	8 38 11·40	(+ 57) „		5·68	46·677	+0·140			3·63	−1·70		
23[5]	6 17 32	26 36·71 4	8 35 29·45	„ „		5·43	36·660	+0·107			26·59	+2·96		
24	6 15 18	28 17·97 4	8 34 37·06	„ „		5·39	17·920	+0·107			30·11	−1·17		
25[7]	6 13 3	30 0·04 7	8 33 29·17	„ „		5·35	59·963	+0·134			24·89	+1·46		
27[6]	6 8 38	33 26·95 2	8 30 52·34	„ „		5·27	26·307	+0·700			48·61	+1·93		

[1] Obs. difficult (bright twilight). [2] Very difficult; δ perhaps too much south by 2″ or 3″. [3] Faint.
[4] Obs. in haste. [5] Very faint. [6] Very difficult. [7] Good. [8] Dec. uncertain.
* Places from micrometrical comparisons made by Hr. Renz with the 15-inch equatorial; comparison stars determined with the Meridian Circle. Correction for parallax in R.A.: Sept. 28, +0s·185; Oct. 2, +0s·102.

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The Pulkowa observations comparatively having only little weight, the large errors of many of them appear to be accidental ordinary errors of observation only, with the one exception, for the two first months of the series used in the determination of the correction of the ephemeris and for parallax, of the Declination August 22, which being full 4″ in error seems to contain some mistake and was excluded.

Vienna (v. Kuffner's Observatory).

1889	Obs.	Observed Place	Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph	v'	v	Dec. Eph. C	Red. δ / Eph.	v'	v
		h m s ° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
June 18	H	20 2 1·303 — 7 37 8·44	—0·032	—0·07	18	7·92	1·400	—0·129	—0·114	—0·123	0·88	+0·29	—0·12	—0·37
25	H	19 59 13·000 6 39 18·03	— 59	+1·02	12	8·14	12·928	+0·013	+ 25	+ 18	9·54	+0·67	+0·10	—0·06
July 11	H	48 7·855 5 6 11·46	— 100	+0·64	13	8·43	7·744	+0·011	+ 29	+ 27	4·18	+1·79	+0·82	+1·03
25	O	36 31·409 4 38 36·56	— 71	+0·96	20	8·39	31·374	—0·036	— 2	— 19	29·82	+2·61	+1·81	+1·74
Aug. 9	O	27 12·345 5 1 32·79	— 161	+0·61	11	8·04	12·181	+0·003	+ 25	+ 25	23·89	—0·25	—0·93	—0·97
19	H	24 44·446 5 37 9·94	+ 5	—0·01	18	7·68	44·550	—0·099	— 90	— 78	4·97	+2·70	+2·11	+2·08

Washington.

1889	Obs.	Observed Place	Total Reduct.		No. st.	Par.	R.A. Eph. C	Red. α / Eph.	v'	v	Dec. Eph. C	Red. δ / Eph.	v'	v
		h m s ° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
July 8	S	19 50 20·69 — 5 17 40·6	—0·144	+0·89	8	7·29	20·567	—0·021	—0·005	—0·003	33·40	+0·98	+0·04	+0·23
16	E	43 43·93 4 49 40·7	— 77	—0·03	9	7·31	43·808	+0·045	+ 67	+ 54	35·47	+2·05	+1·25	+1·24
Aug. 12	E	26 1·54 5 11 50·3	— 122	—0·07	9	6·87	1·435	—0·017	0	+ 2	43·60	+0·10	—0·53	—0·59
16	S	25 4·32 5 26 20·4	— 144	—0·26	7	6·75	4·165	+0·011	+ 21	+ 29	13·29	—0·62	—1·22	—1·28
21	S	24 40·81 5 46 35·7	— 55	—0·17	9	6·59	40·723	+0·032	+ 41	+ 55	28·76	—0·52	—1·09	—1·10
26	S	25 12·72 6 8 20·5	— 131	—0·35	11	6·42	12·567	+0·022	+ 35	+ 51	14·91	+0·48	—0·05	+0·04
27	H	25 25·80 6 12 48·6	— 66	+0·56	5	6·38	25·633	+0·101	+ 116	+ 131	42·31	+0·65	+0·13	+0·24
29	H	25 58·49 6 21 44·9	— 92	+0·62	10	6·31	58·438	—0·040	— 23	— 10	39·48	+1·51	+1·01	+1·16

In the following general table, $\Delta\alpha$ and $\Delta\delta$ are the corrections to Eph. C found in the preceding comparison, p their weights, and v' the apparent remaining errors of the separate reduced observations.

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The adopted weights are $p = p_1 \cdot \frac{n}{n+1}$, where n is the number of comparison stars observed with the planet and used to determine the day correction, and p_1 is the weight of the result of one observation of a comparison star—or a star of the fainter class, when a distinction is made in the table between the reference and the comparison stars, or between brighter and fainter stars belonging to the series—taken from the table, Vol. II., pp. 702–3. As the numbers of that table strictly refer to results containing an average amount of uncertainty of the zero-points, to multiply them again by $n : n + 1$ is correct only so far as to allow for the difference of weights within one observer's series, and the use here made of the factor implies a small diminution of the mean error assumed for the unity of weights, which however is quite insignificant. Further, the same relation of accidental to constant error is not to be supposed in the observed differences, planet – comparison stars, which was found for the star places resulting from the observations. Something arbitrary, therefore, is connected with the use of the weights here adopted, but there seems no room for appreciable doubt that they fairly represent the relative accuracy of the observations throughout; nor, for the Declinations at least, is there any reason to doubt that the true mean error for weight unity corresponds very nearly with the assumed mean error, viz., $\pm\ 0^s{\cdot}0316$ and $\pm\ 0''{\cdot}316$ respectively.

For the few observations without comparison stars, the weight p was put $= \frac{1}{2} p_1$, and numbers between $\frac{1}{2} p_1$ and $\frac{n}{n+1} \cdot p_1$ were adopted in those cases when the reduction used was a mean from a day correction and the observer's mean reduction.

The weights so computed were diminished, in proportion $\frac{3}{4}$, $\frac{2}{3}$, or $\frac{1}{2}$, in those cases where a note was given with the observation showing it to be decidedly inferior in accuracy to the remainder of the same series. For Melbourne, the factor $\frac{1}{2}$ was introduced for the Declinations depending upon one pointing only of the telescope-micrometer, because the value p_1 given in the table refers to observations generally depending upon double pointings; for Leipzig, the value p_1 given for comparison stars in the table, referring to observations with single pointings, was used for the two observations of the planet made in the same manner, while the value given for reference stars—which generally were observed with double pointings—was taken for the Declinations of the planet depending upon two or three pointings.

The normal weights p_1 are repeated in the following table, and with them are given: the means of the actually adopted weights; the means of the apparent errors e' of the separate observations belonging to each single series, formed without regard to the weights and excluding the few observations mentioned before which apparently contain some gross mistake, or the apparent values of the constant difference of the series from the adopted mean of all; and the average absolute amount of the apparent errors v'.

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Observatory	Right Ascensions					Declinations				
	p_1	Mean p	Mean difference	Average app. error	from obs.	p_1	Mean p	Mean difference	Average app. error	from obs.
			s	s				″	″	
Berlin	1·9	1·68	— 0·005	0·0242	19	0·9	0·85	— 0·11	0·313	18
Naples	1·5	1·36	— 0·007	0·0218	48	0·6	0·54	— 0·01	0·420	48
Mt. Hamilton.	1·0	0·89	— 0·028	0·0304	12	0·7	0·63	— 0·07	0·257	11 (1 obs. excl.)
Leiden	1·3	1·21	0·000	0·0239	13	0·5	0·47	+ 0·17	0·358	13
Cape G. H. ...	0·4	0·36	— 0·009	0·0341	47	0·5	0·45	+ 0·06	0·332	45 (2 obs. excl.)
Paris, C. du J.	0·3	0·27	— 0·007	0·0439	14	0·4	0·36	+ 0·20	0·429	14
Melbourne ...	0·4	0·36	— 0·005	0·0535	11	0·3	0·24	— 0·21	0·409	10
Leipzig	0·3	0·22	+ 0·017	0·0476	33	0·4	0·27	+ 0·09	0·388	33
Cordoba	0·5	0·32	0·000	0·0398	26	0·3	0·18	+ 0·10	0·475	26
Algiers	0·3	0·27	— 0·017	0·0347	13	0·2	0·18	+ 0·17	0·380	15
Washington...	0·5	0·44	+ 0·030	0·0398	8	0·1	0·09	— 0·06	0·665	8
Oxford	0·3	0·20	— 0·007	0·0401	14	0·3	0·21	+ 0·03	0·394	14
Greenwich ...	0·3	0·26	+ 0·082	0·0945	15	0·2	0·17	+ 0·11	0·679	15
Camb. (Eng.)	0·2	0·18	+ 0·012	0·0681	14	0·2	0·18	— 0·37	0·435	14
Dublin	0·2	0·13	+ 0·056	0·1165	4	0·2	0·18	— 0·55	0·550	4
Vienna	0·3	0·28	— 0·022	0·0460	6	0·1	0·09	+ 0·60	0·945	6
Paris, G. I. M.	0·1	0·09	+ 0·031	0·0988	21	0·2	0·18	+ 0·09	0·496	21
Königsberg ...	0·3	0·26	+ 0·035	0·0696	12	0·1	0·09	— 0·11	1·354	10 (1 obs. excl.)
Pulkowa	0·2	0·17	— 0·002	0·0727	24	0·1	0·08	+ 0·11	0·807	23 (1 obs. excl.)
Cincinnati ...	0·1	0·08	+ 0·027	0·0641	8	0·1	0·08	+ 0·07	0·575	8
Hamburg	0·1	0·08	— 0·057	0·1077	6	0·05	0·04	— 0·11	1·372	6
Camb. (Mass.)	0·1	0·07	— 0·016	0·0394	12	0·1	0·07	+ 0·23	0·979	12

The mean differences are not in all cases so small as might be expected from the differential treatment of the observations. Some of the larger differences however are liable to considerable uncertainty, and only two of them really are striking, the negative deviation of the Mt. Hamilton Right Ascensions because of its considerable value being shown in very close agreement by 11 out of the 12 observations, and the extraordinary excess of the Right Ascensions in the Greenwich observations, which however contain some largely discordant values and appear not to possess their general accuracy in this series. The next striking value is the deviation of $-0''\cdot37$ in the Cambridge (Eng.) Declinations, in which the observations also in this case very nearly agree.

It would not be legitimate to make any allowance for these apparent constant deviations, because the relations between the different series have been established, by the comparison of the star places, with an accuracy far exceeding that which could be claimed for a result derived from comparison of a very much smaller number of observations of the planet, and were found indeed to be established nearly in every case quite in a satisfactory manner, as well for Right Ascension as for Declination.

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No physical cause then can be assigned from which real outstanding differences should come after all the reductions have been applied. It must be understood, therefore, that all of the apparent mean deviations are nothing but products of an accidental grouping of accidental errors, and the planet's places, as derived in the preceding reduction, must be treated in the further discussion as systematically homogeneous throughout.

The average amount of apparent error satisfactorily accords on the whole with the assumptions made for the weights. Some larger discordances can be regarded as accidental and due to the small number of observations of the planet. The mean errors, and consequently the weights, were much more accurately ascertained before from the discussion of the star places than could be done here with the planet observations.

General Table of Comparison with Eph. C, and Outstanding Errors.

Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$			
						N. Obs.	S. Obs.	p	v'
			s		s	"	"		"
June	3·61	Cp	+ 0·074	0·36	+ 0·062		+ 0·27	0·47	+ 0·06
	66	A	+ 59	0·28	+ 47	+ 0·40		0·19	+ 0·19
	4·65	A	+ 0·047	0·28	+ 38	+ 0·29		0·19	+ 0·07
	5·61	Cp	+ 0·041	0·36	+ 35		− 0·30	0·45	− 0·53
	65	A	+ 2	0·28	− 4	+ 0·61		0·19	+ 0·38
	7·60	Cp	+ 0·025	0·37	+ 26		+ 0·45	0·46	+ 0·21
	61	N	+ 29	1·36	+ 30	+ 0·52		0·55	+ 0·28
	62	B	− 39	1·78	− 38	+ 0·36		0·84	+ 0·12
	62	Lz	+ 58	0·29	+ 59	+ 0·31		0·39	+ 0·07
	8·60	Cp	− 0·031	0·37	− 28		+ 0·31	0·46	+ 0·06
	61	N	− 37	1·33	− 34	− 0·33		0·53	− 0·58
	61	B	− 63½	0·88	− 60			...	...
	9·99	MH	− 0·018	0·92	− 11	− 0·10		0·64	− 0·37
	10·59	Cp	− 0·012	0·37	− 4		+ 0·71	0·46	+ 0·43
	61	B	+ 21	1·75	+ 29	+ 0·31		0·83	+ 0·03
	13·59	Cp	+ 0·039	0·34	+ 54		+ 0·39	0·43	+ 0·07
	60	N	− 28	1·33	− 13	− 0·54		0·53	− 0·86
	97	MH	− 50	0·92	− 35	+ 0·06		0·64	− 0·26
	14·63	P gm	+ 0·154	0·03	+ 169	+ 2·53		0·16	+ 2·20
	15·58	Cp	− 0·045	0·37	− 30		+ 0·90	0·46	+ 0·55
	16·62	Ld	− 0·036	1·22	− 21	+ 0·38		0·47	+ 0·01
	96	MH	− 42	0·89	− 26	+ 0·76		0·62	+ 0·38
	17·58	Cp	− 0·035	0·37	− 20		+ 0·44	0·46	+ 0·05
	59	N	+ 10	1·36	+ 26	+ 0·01		0·55	− 0·38
	59	B	− 19	1·75	− 3	+ 0·03		0·83	− 0·36
	59	Lz	− 9	0·29	+ 7	+ 0·94		0·38	+ 0·55
	96	MH	− 1	0·90	+ 14	+ 0·29		0·63	− 0·11

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	"	"		"
June	18·57	Cp	— 0·065	0·36	— 0·050		+ 1·14	0·45	+ 0·73
	58	Vi	— 129	0·28	— 114	+ 0·29		0·09	— 0·12
	58	N	+ 13	1·37	+ 28	+ 1·48		0·55	+ 1·07
	59	B	— 37	1·79	— 22	+ 0·27		0·85	— 0·14
	61	Ld	— 25	1·21	— 10	+ 1·13		0·47	+ 0·72
	96	MH	— 41	0·90	— 26	+ 0·14		0·63	— 0·28
	19·58	N	— 0·009	1·33	+ 6	+ 0·96		0·53	+ 0·53
	61	Ld	— 23	1·22	— 8	+ 1·21		0·47	+ 0·78
	61	A	— 47	0·28	— 32	+ 0·49		0·19	+ 0·06
	96	MH	— 59	0·89	— 44	[— 2·41		0·62	— 2·85]
	20·58	N	— 0·011	1·36	+ 3	+ 0·56		0·55	+ 0·11
	58	B	+ 4	1·79	+ 18	+ 1·09		0·85	+ 0·64
	61	Ld	+ 4	1·21	+ 18	+ 0·94		0·46	+ 0·49
	21·56	Cp	— 0·023	0·37	— 10		+ 0·03	0·46	— 0·43
	58	N	— 89	1·37	— 76	+ 1·19		0·55	+ 0·73
	58	B	+ 11	1·78	+ 24	+ 0·39		0·84	— 0·07
	58	Lz	+ 66 ½	0·09	+ 79	— 0·21 ⅔		0·15	— 0·67
	61	P gm	+ 75	0·09	+ 88	— 0·04		0·18	— 0·50
	95	MH	— 22	0·92	— 9	+ 0·75		0·64	+ 0·28
	22·56	K	+ 0·010	0·26	+ 23	— 0·85		0·09	— 1·34
	56	Cp	+ 15	0·36	+ 28		+ 0·90	0·45	+ 0·41
	57	N	— 13	1·35	0	+ 0·01		0·54	— 0·48
	57	B	— 3	1·74	+ 10	— 0·13		0·82	— 0·62
	58	Lz	— 15	0·28	— 2	+ 0·92		0·37	+ 0·43
	58	H	+ 134	0·09	+ 147	— 0·24		0·05	— 0·73
	81	Cb (M)	+ 19	0·09	+ 32	+ 1·69		0·09	+ 1·19
	23·55	K	+ 0·228	0·27	+ 240	+ 1·81		0·09	+ 1·30
	57	N	+ 34	1·36	+ 46	+ 0·84		0·55	+ 0·33
	57	Lz	+ 17	0·28	+ 29	+ 0·28		0·38	— 0·23
	60	Ld	+ 50	1·22	+ 62	+ 0·71		0·47	+ 0·20
	60	P gm	— 175	0·09	— 163	+ 1·01		0·18	+ 0·50
	95	MH	— 39	0·91	— 27	+ 0·32		0·64	— 0·20
	24·55	K	+ 0·108	0·27	+ 120	+ 2·75		0·09	+ 2·21
	57	B	— 4	1·76	+ 8	+ 1·07 ½		0·42	+ 0·53
	58	H	— 40	0·09	— 28	— 1·16		0·04	— 1·70
	94	MH	— 18	0·92	— 6	+ 0·68		0·65	+ 0·13
	25·56	Vi	+ 0·013	0·28	+ 25	+ 0·67		0·09	+ 0·10
	56	N	+ 2	1·36	+ 14	+ 1·02		0·55	+ 0·45
	57	Lz	+ 26	0·27	+ 38	— 0·09		0·36	— 0·66
	58	H	— 121	0·08	— 109	+ 3·36		0·04	+ 2·79
	59	Ld	— 7	1·21	+ 5	+ 0·33		0·47	— 0·24
	60	P gm	+ 131	0·09	+ 143	+ 0·74		0·18	+ 0·17
	60	Cb (E)	+ 26	0·18	+ 38	+ 0·32		0·18	— 0·25
	61	O	— 119	0·25	— 107	+ 0·88 ⅔		0·17	+ 0·31

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Epoch M. T. B.		Obs.	Δα	p	v′	Δδ N. Obs.	Δδ S. Obs.	Δδ p	Δδ v′
			s		s	″	″		″
June	26·54	K	+ 0·134	0·27	+ 0·145	...		...	...
	55	Cp	— 44	0·36	— 33		+ 1·00	0·45	+ 0·41
	56	N	+ 11	1·35	+ 22	+ 0·55		0·54	— 0·04
	56	B	— 31	1·74	— 20	0·00		0·82	— 0·59
	57	Lz	+ 46	0·28	+ 57	+ 0·26		0·38	— 0·33
	59	Ld	+ 8	1·22	+ 19	+ 0·62		0·47	+ 0·03
	60	Cb (E)	+ 18	0·18	+ 29	+ 0·62		0·18	+ 0·03
	60	O	— 57 ⅔	0·18	— 46	+ 0·53		0·27	— 0·06
	27·55	Cp	— 0·063	0·37	— 52		+ 0·37	0·46	— 0·25
	56	Lz	— 2	0·28	+ 9	+ 0·83		0·37	+ 0·21
	60	Cb (E)	+ 169	0·18	+ 180	+ 0·14		0·18	— 0·48
	28·54	Cp	+ 0·012	0·37	+ 23		+ 0·99	0·46	+ 0·34
	56	Lz	+ 63 ½	0·12	+ 74	+ 0·55 ⅔		0·22	— 0·10
	29·53	K	+ 0·034	0·27	+ 45	— 2·92		0·09	— 3·60
	54	Cp	— 47	0·37	— 30		+ 0·49	0·46	— 0·19
	58	P gm	— 107	0·09	— 96	+ 0·63		0·18	— 0·05
	79	Cb (M)	— 31	0·09	— 20	+ 1·79		0·09	+ 1·11
	30·53	K	— 0·040 ½	0·13	— 29	— 0·28 ⅔		0·06	— 0·98
	55	Lz	+ 27 ½	0·13	+ 38	+ 0·72 ⅔		0·23	+ 0·02
July	1·53	Cp	— 0·035	0·37	— 23		+ 0·53	0·46	— 0·20
	54	N	— 72	1·36	— 60	+ 0·30		0·55	— 0·43
	2·53	Cp	— 0·062	0·37	— 50		+ 0·25	0·46	— 0·50
	55	Lz	— 15	0·25	— 3	+ 1·18		0·33	+ 0·43
	57	P gm	+ 72	0·09	+ 84	+ 0·76		0·18	+ 0·01
	57	P cj	— 130	0·27	— 118	+ 1·47		0·36	+ 0·72
	76	Co	0	0·25	+ 12		+ 0·33	0·15	— 0·43
	3·53	Cp	+ 0·018	0·37	+ 31		+ 0·52	0·46	— 0·26
	57	Ld	— 29	1·22	— 16	+ 0·92		0·47	+ 0·14
	57	P gm	— 184	0·09	— 171	+ 0·65		0·18	— 0·13
	57	P cj	— 32	0·27	— 19	+ 2·12		0·36	+ 1·34
	60	D	— 21 ½	0·09	— 8	— 0·55		0·18	— 1·33
	76	Co	+ 19 ⅔	0·17	+ 32		— 0·14 ⅔	0·10	— 0·92
	4·17	M	— 0·054	0·36	— 41		+ 0·19	0·27	— 0·61
	52	Cp	— 33	0·37	— 19		+ 0·55	0·46	— 0·26
	54	N	+ 8	1·37	+ 22	+ 0·59		0·55	— 0·22
	56	Ld	— 38	1·21	— 24	+ 1·01		0·46	+ 0·20
	57	A	+ 62	0·27	+ 76	+ 1·27		0·18	+ 0·46
	75	Co	+ 3	0·25	+ 17		+ 0·10	0·15	— 0·71
	91	MH	— 66	0·89	— 52	+ 0·50		0·62	— 0·32
	5·17	M	— 0·128	0·37	— 114		+ 0·65	0·28	— 0·18
	49	Pu	+ 68	0·18	+ 82	+ 0·18 ⅔		0·06	— 0·66
	52	Cp	+ 21	0·37	+ 35		+ 1·06	0·46	+ 0·22
	53	N	— 10	1·33	+ 4	+ 1·64		0·53	+ 0·80
	54	Lz	— 86	0·24	— 72	+ 1·89		0·32	+ 1·05

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	″	″		″
July	5·56	Ld	− 0·005	1·22	+ 0·009	+ 0·50		0·47	− 0·34
	56	P gm	− 119	0·09	− 105	+ 1·29		0·18	+ 0·45
	56	P cj	+ 26	0·27	+ 40	+ 1·94		0·36	+ 1·10
	57	Cb (E)	+ 34	0·19	+ 48	+ 1·25		0·19	+ 0·41
	57	Gr	+ 286	0·17	+ 300	+ 2·51		0·12	+ 1·67
	57	O	− 66	0·27	− 52	+ 1·26		0·27	+ 0·42
	75	Co	+ 79	0·25	+ 93		+ 1·06 ⅔	0·10	+ 0·21
	6·17	M	+ 0·058	0·36	+ 72		+ 0·05	0·27	− 0·81
	53	N	− 24	1·35	− 9	+ 0·68		0·54	− 0·19
	53	Lz	− 44	0·25	− 29	+ 1·10 ½		0·17	+ 0·23
	56	P gm	+ 129	0·09	+ 144	+ 1·20		0·18	+ 0·33
	56	P cj	+ 81	0·27	+ 96	+ 0·90		0·36	+ 0·03
	7·53	Lz	− 0·078	0·17	− 62	− 0·06 ½		0·08	− 0·97
	90	MH	− 75	0·87	− 59	+ 1·16		0·61	+ 0·24
	8·48	Pu	+ 0·013 ⅔	0·12	+ 29	+ 1·49		0·09	+ 0·56
	52	N	+ 1	1·36	+ 17	+ 0·44		0·55	− 0·49
	55	A	(+ 157:)	...	...	+ 0·71		0·18	− 0·22
	77	Wa	− 21	0·44	− 5	+ 0·98		0·09	+ 0·04
	90	MH	− 24	0·80	− 8	+ 0·68		0·56	− 0·26
	9·16	M	+ 0·017	0·37	+ 33		− 0·05	0·28	− 1·00
	50	K	− 13	0·27	+ 3	+ 2·64		0·09	+ 1·69
	52	N	− 21	1·31	− 4	+ 0·72		0·52	− 0·23
	52	Lz	− 48	0·24	− 31	+ 1·51		0·32	+ 0·56
	10·47	Pu	− 0·072	0·18	− 55	+ 1·94		0·09	+ 0·98
	52	Lz	+ 2	0·24	+ 19	+ 1·13		0·32	+ 0·16
	56	O	− 25	0·26	− 8	+ 0·68		0·26	− 0·29
	11·47	Pu	+ 0·102	0·18	+ 119	0·00		0·09	− 0·97
	49	K	− 41	0·27	− 24	[+ 5·54		0·09	+ 4·57]
	51	Vi	+ 11	0·28	+ 29	+ 1·79		0·09	+ 0·82
	51	N	− 24	1·36	− 6	+ 1·27		0·55	+ 0·30
	52	Lz	+ 25	0·24	+ 43	+ 0·74		0·32	− 0·23
	55	Cb (E)	+ 69	0·19	+ 87	− 0·02		0·19	− 0·99
	79	Ci	− 30	0·09	− 12	+ 1·57		0·09	+ 0·60
	12·51	N	+ 0·004	1·37	+ 22	+ 0·49		0·55	− 0·48
	54	P gm	+ 95	0·09	+ 113	+ 2·48		0·17	+ 1·51
	54	P cj	0	0·27	+ 18	+ 1·35		0·36	+ 0·38
	13·51	N	− 0·015	1·38	+ 4	+ 0·82		0·55	− 0·12
	72	Co	− 32	0·25	− 13		+ 1·14	0·15	+ 0·20
	78	Ci	+ 82	0·09	+ 101	+ 1·45		0·09	+ 0·51
	114·46	Pu	− 0·330	0·09	− 311	− 0·13 ½		0·05	− 1·04
	50	N	− 11	1·37	+ 8	+ 1·36		0·55	+ 0·46
	15·45	Pu	− 0·063	0·17	− 43	− 0·91		0·09	− 1·77
	50	N	− 3	1·36	+ 17	+ 0·24		0·55	− 0·62
	50	Lz	+ 19	0·24	+ 39	+ 1·19 ½		0·16	+ 0·34

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Epoch M. T. B.		Obs.	Δα	p	v′	Δδ N. Obs.	Δδ S. Obs.	Δδ p	Δδ v′
			s		s	″	″		″
July	15·54	Gr	− 0·050	0·26	− 0·030	+ 1·11		0·17	+ 0·26
	72	Co	− 132	0·25	− 112		+ 0·38	0·17	− 0·46
	74	Cb (M)	− 46	0·09	− 26	− 0·10		0·09	− 0·94
	77	Ci	+ 18	0·09	+ 39	0·00		0·09	− 0·84
	16·50	N	− 0·043	1·35	− 21	+ 0·45		0·54	− 0·36
	71	Co	− 50	0·25	− 28		+ 1·25	0·15	+ 0·45
	75	Wa	+ 45	0·45	+ 67	+ 2·05		0·09	+ 1·25
	17·48	Cp	− 0·007	0·36	+ 16		+ 0·23	0·45	− 0·55
	53	P gm	− 47	0·09	− 24	+ 1·15		0·18	+ 0·38
	53	P cj	− 20	0·27	+ 3	+ 1·13		0·36	+ 0·36
	71	Co	− 41	0·35	− 17		+ 0·51	0·21	− 0·26
	18·13	M	+ 0·033	0·37	+ 57		+ 0·98	0·28	+ 0·23
	48	Cp	− 25	0·37	0		[− 1·30	0·46	− 2·06]
	49	N	− 4	1·38	+ 21	+ 1·20		0·55	+ 0·44
	53	Cb (E)	− 27	0·18	− 2	− 0·46		0·18	− 1·21
	53	Gr	− 24	0·27	+ 1	+ 1·91		0·17	+ 1·16
	53	O	+ 3 ½	0·12	+ 28	+ 1·06 ½		0·13	+ 0·31
	71	Co	− 4	0·35	+ 21		+ 0·25 ⅔	0·14	− 0·50
	73	Cb (M)	− 7	0·09	+ 18	+ 1·59		0·09	+ 0·84
	19·44	Pu	− 0·047	0·18	− 20	+ 1·93		0·09	+ 1·18
	47	Cp	− 45	0·37	− 18		+ 1·27	0·46	+ 0·52
	52	A	− 84	0·22	− 57	+ 1·07		0·15	+ 0·32
	53	Gr	− 35	0·26	− 8	− 0·14		0·17	− 0·89
	70	Co	− 7	0·35	+ 20		+ 1·72 ½	0·10	+ 0·97
	20·12	M	+ 0·033	0·37	+ 61		+ 0·70	0·28	− 0·04
	44	Pu	+ 78 ⅔	0·12	+ 107	+ 2·79 ¾		0·07	+ 2·05
	47	Cp	− 59	0·37	− 30		+ 0·55	0·46	− 0·19
	70	Co	− 88	0·40	− 59		+ 0·61	0·24	− 0·13
	21·43	Pu	− 0·050	0·18	− 20	+ 0·86		0·09	+ 0·12
	48	N	− 117	1·37	− 87	− 0·11		0·55	− 0·85
	72	Cb (M)	− 11	0·09	+ 19	+ 1·00		0·09	+ 0·25
	22·46	Cp	− 0·062	0·37	− 31		+ 0·65	0·46	− 0·10
	48	N	− 47	1·35	− 16	+ 0·90		0·54	+ 0·15
	69	Co	− 52	0·35	− 20		+ 1·41	0·21	+ 0·65
	71	Cb (M)	− 79	0·09	− 47	− 0·39		0·09	− 1·15
	75	Ci	− 28	0·09	+ 4	+ 0·09		0·09	− 0·67
	23·11	M	− 0·029	0·37	+ 3		+ 0·94	0·28	+ 0·18
	43	Pu	− 63	0·18	− 31	+ 0·85		0·09	+ 0·09
	46	Cp	− 15	0·37	+ 17		+ 0·75	0·46	− 0·01
	47	N	− 15	1·33	+ 17	+ 0·85		0·53	+ 0·09
	51	Cb (E)	− 73	0·18	− 40	+ 0·61		0·18	− 0·16
	51	Gr	+ 2	0·27	+ 35	+ 1·59		0·18	+ 0·82
	52	O	− 31	0·25	+ 2	+ 0·03		0·25	− 0·74
	24·46	Cp	− 0·036	0·37	− 3		+ 0·70	0·46	− 0·08

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	″	″		″
July	24·47	N	− 0·064	1·36	− 0·031	+ 1·63		0·55	+ 0·85
	47	Lz	− 4	0·27	+ 29	+ 0·66		0·36	− 0·12
	25·45	K	− 0·039	0·26	− 5	− 0·41		0·09	− 1·21
	45	Cp	− 44	0·36	− 10		+ 1·14	0·45	+ 0·34
	46	Vi	− 36	0·29	− 2	+ 2·61		0·10	+ 1·81
	47	N	− 47	1·36	− 13	+ 0·17		0·55	− 0·63
	50	A (c.)	− 39	0·28	− 5	+ 0·53		0·19	− 0·27
	51	Gr	+ 10	0·27	+ 45	+ 0·72		0·18	− 0·08
	68	Co	− 7	0·40	+ 28		+ 0·19	0·24	− 0·61
	26·10	M	+ 0·037	0·37	+ 62		+ 0·67 ½	0·14	− 0·14
	45	Cp	− 81	0·37	− 46		+ 0·69	0·46	− 0·12
	46	N	− 57	1·29	− 22	+ 1·33		0·51	+ 0·52
	47	H	− 73	0·06	− 38	− 0·78		0·03	− 1·59
	49	A	− 54	0·27	− 19	+ 0·07		0·18	− 0·74
	27·45	Cp	− 0·005	0·37	+ 31		+ 0·98	0·46	+ 0·17
	47	H	− 356	0·09	− 320	+ 0·38		0·04	− 0·43
	50	O	− 5 ½	0·12	+ 31	+ 1·63 ½		0·12	+ 0·82
	73	Ci	+ 57	0·09	+ 93	+ 1·46		0·09	+ 0·65
	28·46	Lz	− 0·016	0·19	+ 21	+ 1·06 ½		0·13	+ 0·25
	29·45	N	− 0·031	1·37	+ 6	+ 0·83		0·55	+ 0·01
	48	Ld	+ 2	1·18	+ 39	+ 0·16		0·45	− 0·66
	48	A	...	...	...	+ 0·91		0·16	+ 0·09
	49	P gm	+ 23	0·09	+ 60	− 0·31		0·18	− 1·13
	49	P cj	− 16	0·28	+ 21	+ 1·31		0·37	+ 0·49
	49	Gr	+ 152	0·24	+ 189	+ 2·07		0·16	+ 1·25
	50	O	+ 1	0·26	+ 38	+ 0·52		0·26	− 0·30
	51	D	+ 33 ⅔	0·12	+ 70	+ 0·27		0·18	− 0·55
	67	Co	− 44	0·29	− 7		+ 1·14	0·18	+ 0·32
	30·41	Pu	+ 0·045	0·18	+ 82	+ 1·95		0·09	+ 1·13
	44	Cp	− 89	0·33	− 52		+ 0·86	0·42	+ 0·04
	45	Lz	+ 66	0·20	+ 103	+ 0·54		0·28	− 0·28
	48	Ld	− 90	1·20	− 53	+ 1·36		0·46	+ 0·54
	48	P gm	+ 28	0·09	+ 65	+ 0·89		0·19	+ 0·07
	48	P cj	+ 41	0·28	+ 78	+ 0·58		0·37	− 0·24
	49	Cb (E)	+ 95	0·17	+ 132	+ 0·50		0·17	− 0·32
	49	Gr	− 79	0·28	− 42	+ 0·63		0·18	− 0·19
	67	Co	+ 6	0·29	+ 43		+ 0·56	0·18	− 0·26
	31·45	N	− 0·002	1·38	+ 35	+ 1·10		0·55	+ 0·29
	45	B	+ 7	1·73	+ 44	+ 0·31		0·82	− 0·50
	45	Lz	+ 84	0·27	+ 121	+ 0·93		0·37	+ 0·12
	46	H	− 34	0·08	+ 3	+ 1·80		0·04	+ 0·99
	47	Ld	− 27	1·21	+ 10	+ 1·11		0·47	+ 0·30
	48	P gm	− 124	0·09	− 87	+ 0·48		0·18	− 0·33
	48	P cj	− 115	0·28	− 78	+ 0·82		0·37	+ 0·01

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Epoch M. T. B.		Obs.	Δα	p	v′	Δδ N. Obs.	Δδ S. Obs.	Δδ p	Δδ v′
			s		s	″	″		″
July	31·49	Gr	+ 0·023	0·27	+ 0·060	+ 0·82		0·18	+ 0·01
	71	Ci(c.)	+ 41	0·09	+ 77	+ 0·98		0·09	+ 0·17
August	1·43	K	— 0·096	0·27	— 60	+ 0·63		0·09	— 0·18
	43	Cp	— 90	0·37	— 54		+ 1·58	0·46	+ 0·77
	44	N	— 39	1·37	— 3	+ 0·57		0·55	— 0·24
	45	B	— 19 ⅔	1·19	+ 17	+ 0·80 ⅔		0·56	— 0·01
	45	Lz	+ 83	0·24	+ 119	+ 0·78		0·32	— 0·03
	66	Co	— 68	0·35	— 32		+ 1·58	0·21	+ 0·77
	2·40	Pu	— 0·130	0·19	— 94	+ 1·10		0·09	+ 0·30
	43	Cp	— 173	0·30	— 137		+ 0·31	0·37	— 0·49
	44	N	— 46	1·38	— 10	+ 0·85		0·55	+ 0·05
	47	P gm	— 13	0·09	+ 23	+ 0·51		0·18	— 0·29
	47	P cj	— 6	0·28	+ 30	+ 0·77		0·37	— 0·03
	66	Co	+ 39	0·29	+ 74		+ 0·54	0·18	— 0·26
	3·44	N	— 0·030	1·25	+ 4	+ 1·65		0·50	+ 0·86
	47	P cj	— 32	0·27	+ 2	+ 0·75		0·37	— 0·04
	48	Cb (E)	— 124	0·18	— 90	+ 0·60		0·18	— 0·19
	48	O	+ 29	0·24	+ 63	+ 0·31		0·24	— 0·48
	65	Co	— 55	0·29	— 21		+ 0·93	0·18	+ 0·15
	4·39	Pu	+ 0·019	0·18	+ 51	+ 1·03		0·09	+ 0·26
	43	N	— 23	1·37	+ 9	+ 0·67		0·55	— 0·10
	5·07	M	— 0·133	0·36	— 102		+ 0·46 ½	0·14	— 0·30
	41	K	+ 28	0·27	+ 58	+ 1·07		0·09	+ 0·32
	42	Cp	— 51	0·36	— 21		+ 1·04	0·45	+ 0·29
	43	N	— 82	1·38	— 52	+ 1·45		0·55	+ 0·70
	46	A	— 9	0·28	+ 21	+ 1·51		0·18	+ 0·76
	47	Cb (E)	— 33	0·18	— 3	+ 0·55		0·18	— 0·20
	47	O	+ 41	0·22	+ 71	+ 0·25		0·22	— 0·50
	65	Co	+ 50	0·29	+ 80		+ 0·20	0·18	— 0·55
	6·42	Cp	— 0·008	0·37	+ 20		+ 0·76	0·46	+ 0·03
	43	N	— 46	1·29	— 18	+ 0·86		0·51	+ 0·13
	47	Cb (E)	+ 43	0·18	+ 71	+ 0·74		0·18	+ 0·01
	47	Gr	+ 87	0·26	+ 115	— 0·71		0·17	— 1·44
	47	O	— 45	0·22	— 17	+ 0·70		0·22	— 0·03
	66	Cb (M)	— 67	0·09	— 39	— 0·07		0·09	— 0·80
	7·41	Cp	— 0·091	0·36	— 65		+ 1·04	0·45	+ 0·32
	42	N	— 19	1·37	+ 7	+ 0·75		0·55	+ 0·03
	43	B	— 16	1·78	+ 10	+ 0·83		0·84	+ 0·11
	46	P cj	— 62	0·28	— 36	— 0·06		0·37	— 0·78
	46	Gr	+ 89	0·27	+ 115	+ 0·87		0·17	+ 0·15
	8·06	M	— 0·053	0·36	— 28		+ 1·31 ½	0·14	+ 0·60
	38	Pu	+ 25	0·18	+ 49	— 0·22		0·09	— 0·92
	9·37	Pu	+ 0·038	0·18	+ 61	+ 1·95		0·09	+ 1·27
	41	Cp	— 7	0·36	+ 15		+ 0·63	0·45	— 0·05

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	"	"		"
August	9·41	Vi	+ 0·003	0·27	+ 0·025	− 0·25		0·09	− 0·93
	42	N	− 24	1·33	− 2	+ 0·15		0·53	− 0·53
	42	B	− 38	1·77	− 16	+ 0·53		0·84	− 0·15
	45	A	− 142	0·28	− 120	+ 1·02		0·19	+ 0·34
	10·40	Cp	+ 0·058	0·36	+ 78		+ 0·48	0·44	− 0·18
	42	Lz	− 22 ½	0·08	− 2	+ 0·89 ⅓		0·07	+ 0·23
	45	P gm	+ 170	0·06	+ 190	− 0·63		0·12	− 1·29
	45	P cj	− 69	0·26	− 49	+ 0·25		0·34	− 0·41
	69	Ci	+ 38	0·09	+ 58	+ 1·31		0·09	+ 0·65
	11·37	Pu	+ 0·026	0·18	+ 44	+ 0·67		0·09	+ 0·02
	41	N	− 50	1·37	− 32	− 0·23		0·55	− 0·88
	12·40	Cp	+ 0·025	0·36	+ 42		+ 1·30	0·45	+ 0·66
	41	Lz	+ 6	0·15	+ 23	+ 0·40		0·20	− 0·24
	44	A	− 61	0·28	− 44	+ 0·81		0·19	+ 0·17
	66	Wa	− 17	0·45	0	+ 0·10		0·09	− 0·53
	13·36	Pu	− 0·146	0·18	− 131	+ 0·47		0·09	− 0·16
	44	P cj	− 53	0·25	− 38	+ 0·55		0·33	− 0·08
	14·39	Cp	− 0·074	0·36	− 61		+ 1·03	0·45	+ 0·41
	15·44	Cb (E)	− 0·082	0·18	− 70	+ 0·44		0·18	− 0·17
	44	Gr	+ 69	0·28	+ 81	− 0·73		0·18	− 1·34
	44	O	− 40 ⅔	0·16	− 28	+ 1·00 ¾		0·18	+ 0·39
	16·39	Cp	− 0·047	0·36	− 36		+ 1·34	0·45	+ 0·74
	40	N	+ 24	1·35	+ 35	+ 0·27		0·54	− 0·33
	40	B	+ 16	1·74	+ 27	+ 0·76		0·82	+ 0·16
	40	Lz	+ 36	0·15	+ 47	+ 0·67		0·20	+ 0·07
	43	P gm	+ 100	0·09	+ 111	+ 0·85		0·18	+ 0·25
	65	Wa	+ 11	0·44	+ 21	− 0·62		0·09	− 1·22
	17·35	Pu	+ 0·114	0·18	+ 124	+ 0·14		0·09	− 0·46
	39	N	− 29	1·35	− 19	+ 0·28		0·54	− 0·32
	43	Cb (E)	− 188	0·17	− 178	− 0·05		0·17	− 0·65
	43	Gr	+ 286	0·27	+ 296	+ 0·29		0·18	− 0·31
	44	O	− 16 ½	0·08	− 6	+ 0·43 ½		0·13	− 0·17
	45	D	− 121	0·18	− 111	+ 0·43		0·18	− 0·17
	18·39	N	− 0·003	1·37	+ 7	+ 1·10		0·55	+ 0·51
	39	B	− 22	1·74	− 12	+ 0·15		0·82	− 0·44
	40	Lz	+ 73	0·26	+ 83	+ 1·72 ½		0·17	+ 1·13
	61	Co	− 83	0·29	− 74		+ 2·38	0·18	+ 1·79
	19·34	Pu	− 0·029	0·18	− 20	+ 1·01		0·09	+ 0·42
	37	K	− 77	0·26	− 68	+ 1·30		0·09	+ 0·71
	38	Cp	− 16	0·36	− 7		+ 0·38	0·44	− 0·21
	38	Vi	− 99	0·28	− 90	+ 2·70		0·09	+ 2·11
	39	N	− 28	1·31	− 19	− 0·11		0·52	− 0·70
	61	Co	− 87	0·40	− 78		+ 1·20	0·24	+ 0·62
	20·34	Pu	+ 0·060 ½	0·18	+ 69	− 0·82 ½		0·05	− 1·40

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	$\Delta\delta$ p	$\Delta\delta$ v'
August	20·37	Cp	+ 0·089 s	0·36	+ 0·098 s	″	+ 0·″88	0·45	+ 0·″30
	39	Lz	+ 61	0·15	+ 70	+ 0·94		0·20	+ 0·36
	42	A	— 17	0·28	— 8	+ 1·85		0·19	+ 1·27
	44	D	+ 267 ⅔	0·12	+ 276	+ 0·43		0·18	— 0·15
	62	Cb (M)	+ 61 ½	0·02	+ 70	+ 2·91		0·05	+ 2·33
	21·05	M	— 0·024	0·33	— 15		...	...	...
	62	Cb (M)	— 58 ⅔	0·03	— 49	+ 0·79		0·05	+ 0·22
	64	Wa	+ 32	0·45	+ 41	— 0·52		0·09	— 1·09
	22·34	Pu	+ 0·054	0·18	+ 63	[+ 4·56		0·09	+ 3·99]
	37	Cp	+ 56	0·36	+ 65		— 0·12	0·44	— 0·69
	41	A (c.)	— 40	0·28	— 31	+ 0·21		0·19	— 0·36
	41	P gm	+ 62	0·09	+ 71	+ 0·39		0·18	— 0·18
	60	Co	— 57	0·40	— 47		+ 0·65	0·24	+ 0·09
	62	Cb (M)	— 41	0·05	— 31	+ 0·40		0·05	— 0·16
	23·37	Cp	+ 0·027	0·37	+ 37		+ 1·35	0·46	+ 0·79
	38	N	— 48	1·33	— 38	+ 0·22		0·53	— 0·34
	24·59	Co	+ 0·027	0·42	+ 39		+ 0·71	0·25	+ 0·17
	65	Ci	— 140	0·05	— 128	+ 0·03		0·05	— 0·51
	25·37	N	— 0·047	1·35	— 35	+ 0·59		0·54	+ 0·05
	37	B	— 52	1·76	— 40	+ 0·80		0·84	+ 0·26
	38	Lz	— 18	0·27	— 6	+ 0·43		0·36	— 0·11
	26·40	P gm	+ 0·091	0·09	+ 104	+ 0·79		0·18	+ 0·25
	62	Wa	+ 22	0·46	+ 35	+ 0·48		0·09	— 0·05
	27·32	Pu	— 0·031	0·15	— 17	— 0·16		0·07	— 0·69
	36	Cp	— 16	0·36	— 2		— 0·21	0·45	— 0·74
	37	Lz	— 25	0·15	— 11	+ 1·33		0·20	+ 0·80
	58	Co	+ 4	0·42	+ 19		+ 0·97 ½	0·13	+ 0·45
	62	Wa	+ 101	0·42	+ 116	+ 0·65		0·08	+ 0·13
	28·32	Pu	— 0·095	0·18	— 80	+ 2·53		0·09	+ 2·01
	35	Cp	— 33	0·36	— 18		[— 1·95	0·44	— 2·46]
	40	P gm	— 57	0·09	— 42	+ 0·15		0·18	— 0·36
	40	Gr	— 27	0·27	— 12	+ 0·86		0·18	+ 0·35
	58	Co	— 7	0·42	+ 9		+ 0·60	0·25	+ 0·09
	60	Cb (M)	— 40	0·05	— 24	+ 1·83		0·05	+ 1·32
	29·32	Pu	— 0·077	0·18	— 61	+ 0·61		0·09	+ 0·11
	37	Lz	— 50	0·25	— 34	+ 0·12		0·33	— 0·38
	40	P gm	+ 7	0·09	+ 23	+ 0·53		0·18	+ 0·03
	40	Cb (E)	— 23	0·18	— 7	— 0·52		0·18	— 1·02
	40	Gr	+ 84	0·27	+ 100	+ 0·77		0·18	+ 0·27
	41	O	— 61	0·24	— 45	+ 1·19		0·24	+ 0·69
	58	Co	+ 63	0·40	+ 80		+ 1·23	0·24	+ 0·73
	62	Wa	— 40	0·45	— 23	+ 1·51		0·09	+ 1·01
	30·36	B	— 0·018	1·79	— 1	+ 0·18		0·85	— 0·31
	36	Lz	— 97	0·27	— 80	— 0·01		0·36	— 0·50
	60	Cb (M)	— 111 ⅔	0·03	— 93	— 0·95		0·05	— 1·44

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Epoch M. T. B.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N. Obs.	$\Delta\delta$ S. Obs.	p	v'
			s		s	″	″		″
August	31·36	B	— 0·051	1·73	— 0·033	— 0·13		0·82	— 0·60
	36	Lz	— 135	0·15	— 117	+ 1·39		0·20	+ 0·92
September	1·36	Lz	+ 0·069	0·15		+ 0·53		0·20	
	2·31	Pu	— 0·076 ½	0·09		+ 2·88		0·09	
	36	Lz	+ 40	0·15		+ 0·13		0·20	
	3·31	Pu	+ 0·004	0·18		+ 0·58		0·09	
	35	Lz	— 173	0·15		— 0·07		0·20	
	4·35	Lz	+ 0·064	0·15		+ 0·05		0·20	
	5·30	Pu	— 0·049	0·18		+ 1·57		0·09	
	7·30	Pu	— 0·109	0·17		+ 0·48		0·09	
	15·28	Pu	— 0·135	0·18		+ 2·56		0·09	
	32	B	— 14	1·75		— 0·46		0·83	
	18·27	Pu	+ 0·097 ½	0·09		+ 1·14 ½		0·05	
	32	B	— 35	1·78		— 0·49		0·84	

Table of Daily Means.

Right Ascension						Declination						Error v'	
Epoch (M. T. B.)	No. obs.	$\Delta\alpha$	p	Gill	Mer. obs. — Gill	Epoch (M. T. B.)	No. obs.	$\Delta\delta$	p	Gill	Mer. obs. — Gill	in R.A.	in Dec.
		s		s	s			″		″	″	s	″
June 3·63	2	+ 0·067	0·64	(— 0·018)	+ 0·085	June 3·62	2	+ 0·31	0·66	(+ 0·72)	— 0·41	+0·055	+0·10
4·65	1	+ 47	0·28	,,	+ 65	4·65	1	+ 0·29	0·19	(0·71)	— 0·42	+0·038	+0·07
5·63	2	+ 24	0·64	,,	+ 42	5·62	2	— 0·03	0·64	(0·70)	— 0·73	+0·018	—0·26
June 7·61	4	— 1	3·80	— 0·018	+ 17	June 7·61	4	+ 0·41	2·24	+ 0·68	— 0·27	0·000	+0·17
8·61	3	— 45	2·58	18	— 27	8·61	2	— 0·03	0·99	0·67	— 0·70	—0·042	—0·28
9·99	1	— 18	0·92	18	0	9·99	1	— 0·10	0·64	0·66	— 0·76	—0·011	—0·37
10·61	2	+ 15	2·12	18	+ 33	10·60	2	+ 0·45	1·29	0·66	— 0·21	+0·023	+0·17
June 13·73	3	— 27	2·59	14	— 13	June 13·75	3	— 0·05	1·60	0·64	— 0·69	—0·012	—0·37
14·63	1	+ 154	0·08	12	+ 166	14·63	1	+ 2·53	0·16	0·64	+ 1·89	+0·169	+2·20
15·58	1	— 45	0·37	10	— 35	15·58	1	+ 0·90	0·46	0·65	+ 0·25	—0·030	+0·55
June 16·76	2	— 39	2·11	9	— 30	June 16·81	2	+ 0·60	1·09	0·65	— 0·05	—0·023	+0·22
17·66	5	— 8	4·67	7	— 1	17·67	5	+ 0·27	2·85	0·66	— 0·39	+0·008	—0·12
18·65	6	— 30	5·91	6	— 24	18·66	6	+ 0·72	3·04	0·66	+ 0·06	—0·015	+0·31
19·69	4	— 28	3·72	4	— 24	19·60	3	+ 0·98	1·19	0·67	+ 0·31	—0·011	+0·55
June 20·59	3	— 1	4·36	3	+ 2	June 20·59	3	+ 0·90	1·86	0·68	+ 0·22	+0·013	+0·45
21·65	6	— 26	4·62	3	— 23	21·66	6	+ 0·51	2·82	0·69	— 0·18	—0·013	+0·05
22·57	7	— 1	4·17	3	+ 2	22·58	7	+ 0·29	2·41	0·70	— 0·41	+0·012	—0·20
23·66	6	+ 30	4·13	3	+ 33	23·68	6	+ 0·63	2·31	0·71	— 0·08	+0·042	+0·12
June 24·67	4	+ 1	3·04	4	+ 5	June 24·77	4	+ 0·91	1·20	0·72	+ 0·19	+0·013	+0·37
25·58	8	— 5	3·72	5	0	25·58	8	+ 0·60	2·04	0·73	— 0·13	+0·007	+0·03
26·57	8	— 0·001	5·58	— 0·006	+ 0·005	26·57	7	+ 0·45	3·11	0·73	— 0·28	+0·010	—0·14

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Right Ascension						Declination						Error v'	
Epoch (M. T. B.)	No. obs.	$\Delta\alpha$	p	Gill	Mer. obs. — Gill	Epoch (M. T. B.)	No. obs.	$\Delta\delta$	p	Gill	Mer. obs. — Gill	in R.A.	in Dec.
		s		s	s			″		″	″	s	″
June 27·56	3	+ 0·008	0·83	— 0·007	+ 0·015	June 27·56	3	+ 0·50	1·01	+ 0·74	— 0·24	+0·019	—0·12
28·54	2	+ 24	0·49	9	+ 33	28·55	2	+ 0·85	0·68	0·75	+ 0·10	+0·035	+0·20
29·57	4	— 25	0·82	10	— 15	29·59	4	+ 0·29	0·82	0·75	— 0·46	—0·014	—0·39
30·54	2	— 6	0·26	12	+ 6	30·55	2	+ 0·51	0·29	0·75	— 0·24	+0·005	—0·19
July 1·54	2	— 64	1·73	13	— 51	July 1·54	2	+ 0·40	1·01	0·75	— 0·35	—0·052	—0·33
2·59	5	— 45	1·23	15	— 30	2·57	5	+ 0·82	1·48	0·75	+ 0·07	—0·033	+0·07
3·58	6	— 24	2·21	17	— 7	3·57	6	+ 0·82	1·75	0·75	+ 0·07	—0·011	+0·04
July 4·60	7	— 23	4·72	18	— 5	July 4·60	7	+ 0·61	2·69	0·75	— 0·14	—0·009	—0·20
5·53	12	— 3	4·95	18	+ 15	5·53	12	+ 1·29	3·34	0·75	+ 0·54	+0·011	+0·45
6·48	5	+ 5	2·32	19	+ 24	6·47	5	+ 0·74	1·52	0·75	— 0·01	+0·020	—0·14
July 7·84	2	— 75	1·04	19	— 56	July 7·86	2	+ 1·02	0·69	0·75	+ 0·27	—0·059	+0·10
8·57	4	— 9	2·72	19	+ 10	8·67	5	+ 0·67	1·47	0·75	— 0·08	+0·007	—0·27
9·46	4	— 17	2·19	18	+ 1	9·44	4	+ 0·90	1·21	0·75	+ 0·15	0·000	—0·06
10·52	3	— 28	0·68	17	— 11	10·53	3	+ 1·07	0·67	0·75	+ 0·32	—0·011	+0·10
July 11·51	7	— 2	2·61	16	+ 14	July 11·53	6	+ 0·93	1·33	0·76	+ 0·17	+0·016	—0·04
12·52	3	+ 8	1·73	14	+ 22	12·52	3	+ 1·09	1·08	0·76	+ 0·33	+0·026	+0·12
13·56	3	— 12	1·72	13	+ 1	13·60	3	+ 0·95	0·79	0·77	+ 0·18	+0·006	+0·01
14·50	2	— 31	1·46	11	— 20	14·50	2	+ 1·24	0·60	0·78	+ 0·46	—0·012	+0·33
July 15·54	7	— 24	2·46	10	— 14	July 15·56	7	+ 0·37	1·32	0·79	— 0·42	—0·004	—0·48
16·58	3	— 25	2·05	9	— 16	16·57	3	+ 0·79	0·78	0·81	— 0·02	—0·003	—0·02
17·57	4	— 25	1·07	9	— 16	17·54	4	+ 0·69	1·20	0·82	— 0·13	—0·001	—0·09
18·48	8	— 5	3·13	9	+ 4	18·47	7	+ 0·97	1·54	0·83	+ 0·14	+0·020	+0·21
July 19·54	5	— 40	1·38	10	— 30	July 19·51	5	+ 1·10	0·97	0·84	+ 0·26	—0·013	+0·35
20·50	4	— 28	1·26	10	— 18	20·43	4	+ 0·75	1·05	0·85	— 0·10	+0·001	+0·01
21·49	3	— 104	1·64	11	— 93	21·50	3	+ 0·15	0·73	0·85	— 0·71	—0·074	—0·59
July 22·53	5	— 51	2·25	12	— 39	July 22·55	5	+ 0·76	1·39	0·87	— 0·11	—0·020	—0·01
23·53	7	— 23	2·95	14	— 9	23·43	7	+ 0·78	1·97	0·87	— 0·09	+0·009	+0·01
24·47	3	— 51	2·00	15	— 36	24·47	3	+ 1·07	1·37	0·87	+ 0·20	—0·018	+0·28
25·50	7	— 35	3·22	17	— 18	25·53	7	+ 0·61	1·80	0·87	— 0·26	0·000	—0·19
July 26·41	5	— 46	2·36	19	— 27	July 26·42	5	+ 0·82	1·32	0·88	— 0·06	—0·013	+0·01
27·50	4	— 44	0·67	21	— 23	27·50	4	+ 1·12	0·71	0·86	+ 0·26	—0·008	+0·31
28·46	1	— 16	0·19	23	+ 7	28·46	1	+ 1·06	0·13	0·86	+ 0·20	+0·021	+0·25
29·53	8	— 4	3·83	25	+ 21	29·49	9	+ 0·74	2·49	0·85	— 0·11	+0·033	—0·08
July 30·49	9	— 35	3·02	26	— 9	July 30·48	9	+ 0·85	2·34	0·84	+ 0·01	+0·002	+0·03
31·46	9	— 7	5·40	27	+ 20	31·47	9	+ 0·79	3·07	0·83	— 0·04	+0·030	—0·02
Aug. 1·46	6	— 37	3·79	28	— 9	Aug. 1·46	6	+ 0·97	2·19	0·82	+ 0·15	—0·001	+0·16
Aug. 2·46	6	— 52	2·53	29	— 23	Aug. 2·47	6	+ 0·65	1·74	0·80	— 0·15	—0·016	—0·14
3·48	5	— 35	2·23	29	— 6	3·48	5	+ 0·99	1·47	0·79	+ 0·20	—0·001	+0·20
4·43	2	— 18	1·55	28	+ 10	4·42	2	+ 0·72	0·64	0·78	— 0·06	+0·014	—0·05
5·51	8	— 47	3·34	27	— 20	5·43	8	+ 0·95	1·99	0·76	+ 0·19	—0·017	+0·20
Aug. 6·45	6	— 20	2·41	26	+ 6	Aug. 6·45	6	+ 0·58	1·63	0·75	— 0·17	+0·008	—0·15
7·43	5	— 20	4·06	25	+ 5	7·43	5	+ 0·72	2·38	0·74	— 0·02	+0·006	0·00
8·17	2	— 27	0·54	24	— 3	8·18	2	+ 0·71	0·23	0·74	— 0·03	—0·002	0·00
9·42	6	— 32	4·19	22	— 10	9·42	6	+ 0·53	2·19	0·72	— 0·19	—0·010	—0·15

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Right Ascension						Declination						Error v'	
Epoch (M. T. B.)	No. obs.	$\Delta\alpha$	p	Gill	Mer. obs. — Gill	Epoch (M. T. B.)	No. obs.	$\Delta\delta$	p	Gill	Mer. obs. — Gill	in R.A	in Dec.
		s		s	s			″		″	″	s	″
Aug. 10·45	5	+ 0·017	0·85	— 0·021	+ 0·038	Aug. 10·45	5	+ 0·37	1·06	+ 0·71	— 0·34	+0·037	—0·28
11·41	2	— 41	1·55	20	— 21	11·40	2	— 0·10	0·64	0·70	— 0·80	—0·023	—0·75
12·50	4	— 12	1·24	19	+ 7	12·44	4	+ 0·89	0·93	0·69	+ 0·20	+0·005	+0·25
13·41	2	— 92	0·43	18	— 74	13·42	2	+ 0·53	0·42	0·69	— 0·16	—0·077	—0·10
Aug. 14·39	1	— 74	0·36	18	— 56	Aug. 14·39	1	+ 1·03	0·45	0·68	+ 0·35	—0·061	+0·41
15·44	3	— 3	0·62	18	+ 15	15·44	3	+ 0·24	0 54	0·67	— 0·43	+0·009	—0·37
16·43	6	+ 15	4·13	18	+ 33	16·41	6	+ 0·70	2·28	0·66	+ 0·04	+0·026	+0·10
17·40	6	+ 2	2·23	19	+ 21	17·41	6	+ 0·26	1·29	0·65	— 0·39	+0·012	—0·34
Aug. 18·48	4	— 13	3·66	20	+ 7	Aug. 18·41	4	+ 0·84	1·72	0·63	+ 0·21	—0·003	+0·25
19·41	6	— 47	2·79	21	— 26	19·42	6	+ 0·58	1·47	0·62	— 0·04	—0·038	—0·01
20·39	6	+ 73	1·11	22	+ 95	20·40	6	+ 1·00	1·12	0·60	+ 0·40	+0·082	+0·42
21·40	3	+ 6	0·81	23	+ 29	21·63	2	— 0·05	0·14	0·58	— 0·63	+0·015	—0·62
Aug. 22·45	6	+ 1	1·36	25	+ 26	Aug. 22·44	5	+ 0·21	1·10	0·55	— 0·34	+0·010	—0·35
23·38	2	— 32	1·70	26	— 6	23·38	2	+ 0·75	0·99	0·53	+ 0·22	—0·022	+0·19
24·60	2	+ 9	0·47	27	+ 36	24·60	2	+ 0·60	0·30	0·50	+ 0·10	+0·021	+0·06
25·37	3	— 47	3·38	28	— 19	25·37	3	+ 0·66	1·74	0·47	+ 0·19	—0·035	+0·12
Aug. 26·58	2	+ 33	0·55	29	+ 62	Aug. 26·47	2	+ 0·69	0·27	0·44	+ 0·25	+0·046	+0·15
27·49	5	+ 20	1·50	30	+ 50	27·41	5	+ 0·36	0·93	0·41	— 0·05	+0·035	—0·16
28·44	6	— 34	1·37	30	— 4	28·47	5	+ 0·87	0·75	0·38	+ 0·49	—0·018	+0·36
Aug. 29·47	8	— 7	2·06	(— 0·030)	+ 23	Aug. 29·44	8	+ 0·62	1·53	(0·35)	+ 0·27	+0·009	+0·12
30·36	3	— 30	2·09	,,	0	30·37	3	+ 0·08	1·26	(0·32)	— 0·24	—0·013	—0·41
31·36	2	— 58	1·88	,,	— 28	31·36	2	+ 0·17	1·02	(0·29)	— 0·12	—0·040	—0·30
Sept. 1·36	1	+ 69	0·15			Sept. 1·36	1	+ 0·53	0·20	(0·26)	+ 0·27		
2·34	2	— 3	0·24			2·34	2	+ 0·85	0·29	(0·23)	+ 0·62		
3·32	2	— 76	0·33			3·34	2	+ 0·13	0·29	(0·20)	— 0·07		
4·35	1	+ 64	0·15			4·35	1	+ 0·05	0·20	(0·17)	— 0·12		
5·30	1	— 49	0·18			5·30	1	+ 1·57	0·09	(0·14)	+ 1·43		
7·30	1	— 109	0·17			7·30	1	+ 0·48	0·09	(+ 0·08)	+ 0·40		
Sept. 15·32	2	— 25	1·93			Sept. 15·32	2	— 0·16	0·92	(— 0·16)	0·00		
18·32	2	— 28	1·87			18·32	2	— 0·40	0·89	(— 0·25)	— 0·15		

Dr. Gill has derived, from his discussion of the heliometer observations, corrections for Ephemeris C running from June 8·0 to August 28·0, which forward the numbers "Gill" of the preceding table. Combining them with the tabulated means of the observed $\Delta\alpha$ and $\Delta\delta$, the numbers of the columns "Mer. obs. – Gill" are found, or the errors of the daily results of the meridian observations under the supposition that the corrections derived from the discussion of the heliometer observations were absolutely correct. The effect of the correction found by Dr. Gill for the Moon's mass is included in these corrections, and produces the 28-day period very noticeable in the Right Ascensions. In the comparison of the individual observations, the errors of the meridian observations which would follow from the said supposition are tabulated in the columns headed v.

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To avoid a marked discontinuity in making use of the first and last of the meridian observations, the first value of Dr. Gill's correction taken from his table has been retained for the Right Ascensions June 3–5, and the last for those of August 29–31, while for the Declinations an extrapolation was made at both ends of the table, in which however the lunar term was neglected.

Grouping the results of three or four consecutive days for June, July, and August, as is shown in the table of daily means by repetition of the month's name for the first day of each group, and forming two more groups from the few observations September 1–7 and September 15–18, the following means were found from the daily values Mer. obs. – Gill, and by adding Gill's corrections to Ephemeris C for the corresponding epoch to them the means $\Delta\alpha$(C) and $\Delta\delta$(C) = red. Mer. obs. – Eph. C.

Means from Groups.

Epoch R.A.	M.O.—G.	p	$\Delta\alpha$ (C)	No. obs.	Epoch Dec.	M.O.—G.	p	$\Delta\delta$ (C)	No. obs.	Apparent Error = v'	
	s		s			″		″		s	″
June 4·63	+ 0·064	1·56	+ 0·046	5	June 4·61	— 0·56	1·49	+ 0·15	5	+ 0·037	— 0·06
8·79	+ 0·007	9·42	— 0·011	10	8·84	— 0·40	5·16	+ 0·27	9	— 0·007	+ 0·02
13·98	— 0·011	3·04	— 0·025	5	14·19	— 0·31	2·22	+ 0·33	5	— 0·009	+ 0·01
18·36	— 0·018	16·41	— 0·024	17	18·20	— 0·08	8·17	+ 0·58	16	— 0·009	+ 0·18
22·08	+ 0·002	17·28	0·000	22	22·16	— 0·14	9·40	+ 0·56	22	+ 0·013	+ 0·08
25·80	+ 0·004	12·34	— 0·001	20	25·91	— 0·14	6·35	+ 0·59	19	+ 0·010	+ 0·01
28·77	+ 0·007	2·40	— 0·001	11	28·70	— 0·22	2·80	+ 0·53	11	+ 0·009	— 0·13
July 2·62	— 0·027	5·17	— 0·042	13	July 2·74	— 0·03	4·24	+ 0·72	13	— 0·030	— 0·03
5·37	+ 0·009	11·99	— 0·009	24	5·39	+ 0·19	7·55	+ 0·94	24	+ 0·005	+ 0·10
8·91	— 0·006	6·53	— 0·024	13	9·07	+ 0·11	4·04	+ 0·86	14	— 0·008	— 0·08
12·79	+ 0·006	7·52	— 0·008	15	12·71	+ 0·28	3·80	+ 1·05	14	+ 0·011	+ 0·07
17·09	— 0·008	8·71	— 0·017	22	17·27	— 0·10	4·84	+ 0·71	21	+ 0·006	— 0·08
20·54	— 0·051	4·28	— 0·061	12	20·39	— 0·13	2·75	+ 0·72	12	— 0·032	— 0·03
24·09	— 0·023	10·42	— 0·038	22	24·04	— 0·08	6·53	+ 0·79	22	— 0·005	+ 0·01
28·26	0·000	7·05	— 0·022	18	28·29	— 0·03	4·65	+ 0·83	19	+ 0·015	+ 0·01
31·53	+ 0·004	12·21	— 0·023	24	31·56	+ 0·03	7·60	+ 0·86	24	+ 0·014	+ 0·05
Aug. 4·07	— 0·013	9·65	— 0·041	21	Aug. 3·95	+ 0·06	5·84	+ 0·85	21	— 0·008	+ 0·07
8·00	— 0·001	11·20	— 0·025	19	7·92	— 0·14	6·43	+ 0·60	19	0·000	— 0·09
11·75	— 0·006	4·07	— 0·026	13	11·67	— 0·25	3·05	+ 0·45	13	— 0·018	— 0·19
16·54	+ 0·023	7·34	+ 0·005	16	16·38	— 0·10	4·56	+ 0·56	16	+ 0·016	— 0·05
19·38	+ 0·010	8·37	— 0·011	19	19·35	+ 0·15	4·45	+ 0·77	18	— 0·002	+ 0·18
24·28	— 0·003	6·91	— 0·030	13	24·05	+ 0·05	4·13	+ 0·56	12	— 0·019	0·00
27·72	+ 0·030	3·42	0·000	13	27·68	+ 0·20	1·95	+ 0·60	12	+ 0·015	+ 0·08
30·37	— 0·001	6·03	— 0·031	13	30·16	0·00	3·81	+ 0·33	13	— 0·014	— 0·17
Sept. 3·94	...	1·32	— 0·025	8	Sept. 3·38	+ 0·30	1·16	+ 0·50	8		
16·80	...	3·80	— 0·026	4	16·80	— 0·07	1·81	— 0·28	4		

The heliometer curve of course is less certain at both its ends, and the most so at its beginning, when it rests upon few observations only beginning with June 10, and upon extrapolation before that date. This may account for its really running away to some

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extent from the planet's path at the beginning, as is indicated by the meridian observations. But the number of these, too, is small before the middle of June, and contributed by some few observatories only. It is quite possible, therefore, that the larger means of M.O. – G. at the beginning of the series still are chiefly due to accidental errors of the meridian observations. The same probably have produced an apparent transitory diminution of R.A. after the middle of July; but it seems beyond doubt that Dr. Gill's heliometer curve makes the planet's path a little too much north during the whole month of June.

Dr. Gill, in his discussion of the heliometer observations, used other star places, viz., those individually depending upon the heliometric triangulation made in 1890. In order to see whether a part of the differences v might arise from this source, the following comparison has been made, in which the stars are arranged in the opposite order of R.A., this giving approximately the order in which they came into use in the heliometer observations:—

Star	Gill – N_4		(Lesser) No. Mer. obs.	Star	Gill – N_4		(Lesser) No. Mer. obs.	Star	Gill – N_4		(Lesser) No. Mer. obs.
	$\Delta\alpha$	$\Delta\delta$			$\Delta\alpha$	$\Delta\delta$			$\Delta\alpha$	$\Delta\delta$	
	s	″			s	″			s	″	
μ	– 0·004	+ 0·03	179	y	– 0·009	+ 0·03	115	m	– 0·004	– 0·03	107
λ	+ 0·008	+ 0·11	64	x	– 0·006	– 0·02	131	l	– 0·011	– 0·01	63
κ	+ 0·007	– 0·07	70	w	+ 0·004	– 0·03	137	k	0·000	+ 0·04	90
ι	+ 0·008	+ 0·02	66	v	– 0·007	– 0·04	92	i	+ 0·003	0·00	84
θ	– 0·006	+ 0·09	88	u	– 0·002	+ 0·03	75	h	– 0·001	+ 0·06	64
η	– 0·005	+ 0·04	79	t	– 0·001	– 0·01	234	g	– 0·007	+ 0·05	86
ζ	0·000	– 0·08	72	s	– 0·002	+ 0·01	73	f	+ 0·009	– 0·03	134
ε	– 0·004	– 0·01	91	r	– 0·001	– 0·05	87	e	+ 0·001	0·00	118
δ	– 0·003	+ 0·04	95	q	+ 0·002	+ 0·07	142	d	+ 0·006	– 0·03	117
γ	– 0·005	0·00	88	p	0·000	+ 0·03	234	c	+ 0·004	+ 0·03	90
β	+ 0·001	– 0·09	59	o	– 0·006	– 0·09	67	b	– 0·005	+ 0·06	90
α	+ 0·002	– 0·01	60	n	– 0·010	– 0·02	87	a	+ 0·003	– 0·03	96
z	+ 0·003	+ 0·02	114								

Nothing but a small part of the differences v, therefore, can be attributed to the differences of the star places employed, in which the meridian and the heliometer observations agree in a most remarkable manner.

Plotting the values of the means, M.O. – G., obtained for the groups, and drawing a smooth curve through them, by taking the ordinates of this curve for Berlin noon of every day from June 4 to August 31, and then adding Dr. Gill's corrections, extrapolated beyond the limits June 7 and August 28 as before, a series of corrections was derived, which the meridian observations would require for Eph. C. Another series of these corrections was derived, plotting the group means of observed $\Delta\alpha$ and $\Delta\delta$ directly

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and drawing a smooth curve through them. The mean between the two generally nearly accordant series is given in the following table:—

Apparent Corrections to Eph. C from Meridian Observations.

Berlin Mean Noon	Δα	Δδ	Berlin Mean Noon	Δα	Δδ	Berlin Mean Noon	Δα	Δδ
	s	″		s	″		s	″
June 4	+ 0·011	+ 0·21	July 4	— 0·013	+ 0·79	Aug. 3	— 0·035	+ 0·79
5	8	·22	5	14	·82	4	33	·78
6	4	·23	6	14	·85·	5	31	·76
7	+ 0·001	·24	7	15	·89	6	29	·74
8	— 0·002	·24·	8	16	·92	7	27·	·72·
9	4	·25·	9	16	·94·	8	25	·71
10	7	·27	10	17	·96	9	23·	·68·
11	9·	·28	11	17	·97	10	21	·67
12	12	·29	12	18	·97	11	19	·65
13	14	·31	13	18·	·95·	12	17·	·64
14	15	·32	14	19	·93	13	16	·63
15	15	·34	15	19	·88	14	14	·62
16	15·	·36	16	21	·83	15	12·	·61
17	15·	·38	17	22·	·79	16	11	·60
18	15·	·40	18	24	·76	17	10	·60
19	15	·42	19	26	·75	18	10	·59·
20	14·	·44	20	28	·74	19	9	·59
21	14	·45	21	29·	·74	20	9	·58
22	13	·47·	22	31	·75	21	9	·58
23	12·	·50	23	32	·76	22	9	·57
24	12	·52·	24	33	·77	23	10	·56
25	12	·55	25	34	·79	24	11	·55
26	12	·58	26	35	·80·	25	12	·54
27	11	·60	27	36	·81	26	12·	·54
28	11	·63·	28	36·	·81	27	14	·53
29	11	·66	29	37	·82	28	15	·52
30	11	·69	30	37	·82	29	16	·50·
July 1	11	·71	31	36·	·81·	30	17	·49·
2	12	·74	Aug. 1	36	·81	31	18	·48
3	12·	·76	2	36	·80·			

With this table, the apparent errors are found for the individual reduced observations, their daily means and the means from the 24 groups for the months June to August, which are given in the columns headed v' of the preceding tables.

The variation of the correction Δδ to Eph. C taken from the same table has been used in combining the Declinations observed in different hemispheres for a determination of the correction of the assumed constant of parallax 8″·80. The result however would not be changed if the variations of Dr. Gill's corrections were used instead, as there always is but a small interval between the epochs of the northern and southern observations which directly were compared.

The following table contains the data upon which is to be founded the

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Determination of Parallax.

Table of Daily Means of Observed Corrections $\Delta\delta$ to Eph. C from observations of Northern and of Southern Observatories separately.

Epoch		Observations from N. Hem.			Epoch		Observations from S. Hem.			Red.
		$\Delta\delta$	p	Par.			$\Delta\delta$	p	Par.	
		″		″			″		″	″
June	3·66	+ 0·40	0·19	6·3	June	3·62	+ 0·27	0·47	3·5	
	4·65	+ 0·29	0·19	6·3						
	5·65	+ 0·61	0·19	6·3		5·61	− 0·30	0·45	3·6	
	7·62	+ 0·40	1·78	7·5		7·60	+ 0·45	0·46	3·7	
	8·61	− 0·33	0·53	6·9		8·60	+ 0·31	0·46	3·7	
	9·99	− 0·10	0·64	6·5						
	10·61	+ 0·31	0·83	8·0		10·59	+ 0·71	0·46	3·8	
	13·80	− 0·21	1·17	6·8		13·59	+ 0·39	0·43	4·0	
	14·63	+ 2·53	0·16	7·8						
						15·58	+ 0·90	0·46	4·1	
	16·81	+ 0·60	1·09	7·4		—				
	17·69	+ 0·24	2·39	8·1		17·58	+ 0·44	0·46	4·2	
	18·68	+ 0·65	2·59	8·0		18·57	+ 1·14	0·45	4·2	
	19·60	+ 0·98	1·19	7·6		—				
	20·59	+ 0·90	1·86	8·0						
	21·68	+ 0·60	2·36	7·7		21·56	+ 0·03	0·46	4·4	
	22·58	+ 0·15	1·96	8·1		22·56	+ 0·90	0·45	4·4	
	23·68	+ 0·63	2·31	7·7		—				
	24·77	+ 0·91	1·20	7·6						
	25·58	+ 0·57	2·04	8·1		—				
	26·57	+ 0·35	2·66	8·3		26·55	+ 1·00	0·45	4·6	
	27·57	+ 0·66	0·55	8·5		27·55	+ 0·37	0·46	4·6	
	28·56	+ 0·55	0·22	8·5		28·54	+ 0·99	0·46	4·7	
	29·62	+ 0·03	0·36	8·5		29·54	+ 0·49	0·46	4·7	
	30·55	+ 0·51	0·29	8·7						
July	1·54	+ 0·30	0·55	7·4	July	1·53	+ 0·53	0·46	4·8	
	2·56	+ 1·21	0·87	8·5		2·59	+ 0·27	0·61	4·7	
	3·57	+ 1·02	1·19	8·6		3·57	+ 0·40	0·56	4·8	
	4·68	+ 0·73	1·81	7·6		4·45	+ 0·36	0·88	5·0	+ 0·01
	5·57	+ 1·41	2·50	8·0		5·43	+ 0·94	0·84	5·0	
	6·54	+ 0·88	1·25	8·1		6·17	+ 0·05	0·27	5·5	+ 0·01
	7·86	+ 1·02	0·69	7·3		—				
	8·67	+ 0·66	1·47	7·4						
	9·52	+ 1·18	0·93	8·1		9·16	− 0·05	0·28	5·6	+ 0·01
	10·53	+ 1·06	0·67	8·9		—				
	11·53	+ 0·93	1·33	8·2		—				
	12·52	+ 1·09	1·08	8·0						
	13·55	+ 0·91	0·64	7·6		13·72	+ 1·14	0·15	4·7	
	14·50	+ 1·24	0·60	7·8		—				
	15·54	+ 0·37	1·15	8·1		15·72	+ 0·38	0·17	4·7	
	16·54	+ 0·68	0·63	7·6		16·71	+ 1·25	0·15	4·7	
	17·53	+ 1·14	0·54	8·5		17·55	+ 0·32	0·66	5·0	

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Epoch		Observations from N. Hem.			Epoch		Observations from S. Hem.			Red.
		Δδ	p	Par.			Δδ	p	Par.	
		″		″			″		″	″
July	18·53	+ 1·05	1·12	8·0	July	18·32	+ 0·74	0·42	5·4	
	19·50	+ 0·76	0·41	8·3		19·51	+ 1·35	0·56	5·1	
	20·44	+ 2·79	0·07	9·5		20·43	+ 0·61	0·98	5·2	
	21·50	+ 0·15	0·73	8·3						
	22·56	+ 0·64	0·72	7·5		22·53	+ 0·89	0·67	5·0	
	23·49	+ 0·76	1·23	8·3		23·33	+ 0·82	0·74	5·4	
	24·47	+ 1·25	0·91	7·8		24·46	+ 0·70	0·46	5·1	
	25·48	+ 0·49	1·11	7·7		25·50	+ 0·81	0·69	5·0	
	26·47	+ 0·93	0·72	7·4		26·37	+ 0·69	0·60	5·6	
	27·58	+ 1·37	0·25	7·2		27·45	+ 0·98	0·46	5·1	
	28·46	+ 1·06	0·13	8·7						
	29·48	+ 0·72	2·31	8·2		29·67	+ 1·14	0·18	4·7	
	30·47	+ 0·88	1·74	8·6		30·51	+ 0·77	0·60	5·0	
	31·47	+ 0·79	3·07	8·3						
Aug.	1·45	+ 0·70	1·52	8·2	Aug.	1·50	+ 1·58	0·67	4·9	
	2·45	+ 0·79	1·19	8·0		2·51	+ 0·39	0·55	4·9	
	3·46	+ 1·00	1·29	8·1		3·65	+ 0·93	0·18	4·6	
	4·42	+ 0·72	0·64	7·6						
	5·45	+ 1·08	1·22	7·7		5·41	+ 0·74	0·77	4·9	
	6·47	+ 0·51	1·17	7·9		6·42	+ 0·76	0·46	4·9	
	7·44	+ 0·64	1·93	8·1		7·41	+ 1·04	0·45	4·9	
	8·38	— 0·22	0·09	9·1		8·06	+ 1·31	0·14	5·5	— 0·01
	9·42	+ 0·50	1·74	7·1		9·41	+ 0·63	0·45	4·8	
	10·48	+ 0·30	0·62	8·0		10·40	+ 0·48	0·44	4·8	
	11·40	— 0·10	0·64	7·4						
	12·47	+ 0·50	0·48	7·3		12·40	+ 1·30	0·45	4·7	
	13·42	+ 0·53	0·42	8·2						
						14·39	+ 1·03	0·45	4·6	
	15·44	+ 0·24	0·54	8·2						
	16·42	+ 0·55	1·83	7·5		16·39	+ 1·34	0·45	4·6	
	17·41	+ 0·27	1·29	7·7						
	18·39	+ 0·66	1·54	7·7		18·61	+ 2·38	0·18	4·2	
	19·38	+ 0·50	0·79	7·8		19·46	+ 0·67	0·68	4·4	
	20·43	+ 1·08	0·67	7·4		20·37	+ 0·88	0·45	4·5	
	21·63	— 0·05	0·14	6·7						
	22·43	+ 0·31	0·42	6·9		22·45	+ 0·15	0·68	4·3	
	23·38	+ 0·22	0·53	6·7		23·37	+ 1·35	0·46	4·3	
	24·65	+ 0·03	0·05	6·5		24·59	+ 0·71	0·25	3·9	
	25·37	+ 0·66	1·74	7·4						
	26·47	+ 0·69	0·27	7·1						
	27·42	+ 0·88	0·35	7·5		27·41	+ 0·06	0·58	4·1	
	28·41	+ 1·00	0·50	7·5		28·58	+ 0·60	0·25	3·8	
	29·41	+ 0·51	1·29	7·4		29·58	+ 1·23	0·24	3·7	
	30·37	+ 0·08	1·26	7·5						
	31·36	+ 0·17	1·02	7·5						

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The column "Red." gives the reduction of the $\Delta\delta$ observed in the southern hemisphere to the mean epoch of the northern observations made on the same day. This reduction exceeds 0″·005 on four days only. A comparison, therefore, of the daily means obtained for the same day from the two hemispheres can be considered altogether as free from the effects of the errors of the ephemeris, and can be made for 56 days as shown in the following table :—

Determination of Parallax from combination of Observations made on the same day.

Day		$\Delta\delta$ S.—N.	p	Sum Par.	Factor of $\Delta\pi$	$\Delta\pi$	Weight	Day		$\Delta\delta$ S.—N.	p	Sum Par.	Factor of $\Delta\pi$	$\Delta\pi$	Weight
		″		″		″				″		″		″	
June	3	— 0·13	0·135	9·8	1·11	— 0·116	0·17	July	22	+ 0·25	0·347	12·5	1·42	+ 0·176	0·70
	5	— 0·91	0·134	9·9	1·13	— 0·809	0·17		23	+ 0·07	0·462	13·7	1·55	+ 0·044	1·11
	7	+ 0·05	0·366	11·2	1·27	+ 0·039	0·59		24	— 0·55	0·306	12·9	1·47	— 0·375	0·66
	8	+ 0·64	0·246	10·6	1·20	+ 0·532	0·36		25	+ 0·32	0·425	12·7	1·44	+ 0·222	0·89
	10	+ 0·40	0·296	11·8	1·34	+ 0·298	0·53		26	— 0·24	0·327	13·0	1·48	— 0·163	0·71
	13	+ 0·60	0·315	10·8	1·23	+ 0·489	0·47		27	— 0·39	0·162	12·3	1·40	— 0·279	0·32
	17	+ 0·20	0·386	12·3	1·40	+ 0·143	0·75		29	+ 0·42	0·167	12·9	1·47	+ 0·286	0·36
	18	+ 0·49	0·383	12·2	1·39	+ 0·353	0·70		30	— 0·11	0·446	13·6	1·54	— 0·071	1·07
	21	— 0·57	0·385	12·1	1·37	— 0·415	0·73	Aug.	1	+ 0·88	0·293	13·1	1·49	+ 0·591	0·65
	22	+ 0·75	0·366	12·5	1·42	+ 0·528	0·74		2	— 0·40	0·376	12·9	1·47	— 0·273	0·81
	26	+ 0·65	0·385	12·9	1·47	+ 0·443	0·81		3	— 0·07	0·158	12·7	1·44	— 0·049	0·33
	27	— 0·29	0·250	13·1	1·49	— 0·195	0·56		5	— 0·34	0·472	12·6	1·43	— 0·237	0·97
	28	+ 0·44	0·149	13·2	1·50	+ 0·293	0·33		6	+ 0·25	0·330	12·8	1·45	+ 0·172	0·70
	29	+ 0·46	0·202	13·2	1·50	+ 0·307	0·45		7	+ 0·40	0·364	13·0	1·48	+ 0·271	0·79
July	1	+ 0·23	0·250	12·2	1·28	+ 0·180	0·41		8	+ 1·52	0·055	14·6	1·66	+ 0·916	0·15
	2	— 0·94	0·451	13·2	1·50	— 0·627	1·02		9	+ 0·13	0·358	11·9	1·35	+ 0·096	0·65
	3	— 0·62	0·381	13·4	1·52	— 0·407	0·88		10	+ 0·18	0·257	12·8	1·45	+ 0·124	0·43
	4	— 0·36	0·592	12·6	1·32	— 0·273	1·03		12	+ 0·80	0·232	12·0	1·37	+ 0·584	0·44
	5	— 0·49	0·629	13·0	1·48	— 0·332	1·37		16	+ 0·79	0·361	12·1	1·37	+ 0·575	0·68
	6	— 0·82	0·222	13·6	1·54	— 0·531	0·53		18	+ 1·72	0·161	11·9	1·35	+ 1·272	0·29
	9	— 1·22	0·215	13·7	1·56	— 0·784	0·52		19	+ 0·17	0·374	12·2	1·39	+ 0·123	0·72
	13	+ 0·23	0·122	12·3	1·40	+ 0·165	0·24		20	— 0·20	0·269	11·9	1·35	— 0·148	0·49
	15	+ 0·01	0·148	12·8	1·45	+ 0·007	0·31		22	— 0·16	0·259	11·2	1·27	— 0·126	0·42
	16	+ 0·57	0·121	12·3	1·40	+ 0·407	0·24		23	+ 1·13	0·246	11·0	1·28	+ 0·879	0·41
	17	— 0·82	0·297	13·5	1·53	— 0·535	0·70		24	+ 0·68	0·042	10·4	1·18	+ 0·575	0·58
	18	— 0·31	0·305	13·4	1·52	— 0·204	0·71		27	— 0·82	0·218	11·6	1·32	— 0·622	0·38
	19	+ 0·59	0·237	13·4	1·52	+ 0·388	0·55		28	— 0·40	0·167	11·3	1·28	— 0·312	0·27
	20	— 2·18	0·065	14·7	1·67	— 1·305	0·18		29	+ 0·72	0·202	11·1	1·27	+ 0·568	0·32

Combining the 56 day results for $\Delta\pi$ according to their computed weights, the mean is : $\Delta\pi = +0''\cdot017$, weight 32·39.

The distribution of the observations however is not favourable throughout for this manner of treatment ; there are corresponding northern observations for all but two days

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with southern observations, but no use is made of the considerable number of observations gathered by the northern observatories on 29 more days during the months June to August. These can be rendered useful, and at the same time the observations used in the preceding determination can be made to contribute to the result much more nearly in proportion to their real accuracy, by forming groups for some consecutive days and comparing the means from the northern and from the southern observations comprised within each group.

The limits of the 24 groups into which the period June 3 to August 30 was divided, are already indicated in the preceding table. The observations made in the northern hemisphere June 19, 24, 25, July 11, and, besides, August 31, altogether 23 observations from the three months, were not used, in order that the possible influence of the errors of the ephemeris should remain practically insensible; the southern observations are included in the groups without exception. The following table contains the particulars of the comparison :—

Determination of Parallax from Groups.

Group	Ep.	$\Delta\delta$	p	Par.	Red.	$\Delta\delta$ S.—N.	p	Sum Par.	Factor of $\Delta\pi$	$\Delta\pi$	Weight
		″		″	″	″		″		″	
June 3 to 5	4·65	+0·433	0·57	+6·3	+0·001	—0·441	0·352	9·8	1·119	—0·394	0·451
	4·59	—0·009	0·92	—3·5							
7 „ 10	8·82	+0·192	3·78	+7·4	—0·002	+0·296	1·011	11·1	1·261	+0·235	1·609
	8·95	+0·490	1·38	—3·7							
13 „ 16	15·21	+0·333	2·42	+7·1	+0·012	+0·333	0·651	11·1	1·267	+0·263	1·045
	14·62	+0·654	0·89	—4·0							
17 „ 18	18·21	+0·454	4·98	+8·0	+0·004	+0·336	0·769	12·2	1·392	+0·241	1·491
	18·02	+0·786	0·91	—4·2							
20 „ 23	22·19	+0·571	8·49	+7·9	+0·003	—0·108	0·822	12·3	1·398	—0·077	1·605
	22 06	+0·460	0·91	—4·4							
26 „ 29	27·15	+0·371	3·79	+8·3	—0·027	+0·313	1·234	13·0	1·477	+0·212	2·693
	28·05	+0·711	1·83	—4·6							
30 „ Jl. 3	2·58	+0·891	2·90	+8·4	—0·001	—0·503	1·044	13·2	1·500	—0·335	2·349
	2·63	+0·389	1·63	—4·8							
July 4 „ 7	5·76	+1·065	6·25	+7·9	+0·021	—0·487	1·510	13·0	1·477	—0·330	3·294
	5·16	+0·557	1·99	—5·1							
8 „ 10	9·33	+0·906	3·07	+7·9	+0·003	—0·953	0·257	13·5	1·534	—0·621	0·604
	9·16	—0·050	0·28	—5·6							
12 „ 14	13·32	+1·078	2·32	+7·9	+0·010	+0·072	0·141	12·6	1·432	+0·050	0·289
	13·72	+1·140	0·15	—4·7							
15 „ 17	16·28	+0·630	2·32	+8·1	+0·033	—0·125	0·689	13·0	1·477	—0·085	1·503
	17·10	+0·472	0·98	—4·9							
18 „ 21	19·68	+0·770	2·33	+8·2	0·000	+0·077	1·065	13·4	1·523	+0·051	2·468
	19·71	+0·847	1·96	—5·2							
22 „ 24	23·57	+0·883	2·86	+7·9	+0·002	—0·065	1·131	13·1	1·488	—0·044	2·505
	23·32	+0·816	1·87	—5·2							

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Group	Ep.	Δδ	p	Par.	Red.	Δδ S.—N.	p	Sum Par.	Factor of Δπ	Δπ	Weight
	″			″	″	″		″		″	
July 25 to 27	26·32	+0·747	2·08	+7·5	0·000	+0·065	0·977	12·7	1·443	+0·045	2·033
	26·31	+0·812	1·75	−5·2							
28 „ 31	30·54	+0·788	7·25	+8·3	−0·001	+0·066	0·704	13·2	1·500	+0·044	1·585
	30·32	+0·855	0·78	−4·9							
Aug. 1 „ 3	2·40	+0·824	4·00	+8·1	−0·002	+0·201	1·037	13·0	1·477	+0·136	2·263
	2·17	+1·027	1·40	−4·9							
4 „ 6	5·63	+0·785	3·03	+7·7	+0·003	−0·036	0·875	12·6	1·437	−0·025	1·807
	5·79	+0·746	1·23	−4·9							
7 „ 9	8·38	+0·555	3·76	+7·6	0·000	+0·344	0·807	12·5	1·420	+0·242	1·628
	8·36	+0·899	1·04	−4·9							
10 „ 12	11·37	+0·211	1·74	+7·6	0·000	+0·684	0·589	12·4	1·409	+0·486	1·169
	11·41	+0·895	0·89	−4·8							
13 „ 17	16·29	+0·416	4·08	+7·7	−0·006	+0·763	0·737	12·3	1·398	+0·546	1·440
	15·39	+1·185	0·90	−4·6							
18 „ 20	19·11	+0·712	3·00	+7·7	+0·005	+0·270	0·912	12·1	1·375	+0·196	1·724
	19·66	+0·977	1·31	−4·4							
21 „ 23	22·79	+0·220	1·09	+6·8	0·000	+0·415	0·557	11·1	1·261	+0·329	0·886
	22·82	+0·635	1·14	−4·3							
24 „ 26	25·50	+0·647	2·06	+7·3	−0·005	+0·058	0·223	11·2	1·273	+0·046	0·361
	24·59	+0·710	0·25	−3·9							
27 „ 30	29·43	+0·461	3·40	+7·5	−0·024	−0·039	0·814	11·4	1·301	−0·030	1·378
	28·17	+0·446	1·07	−3·9							

The mean of the 24 determinations is: $\Delta\pi = +0''\cdot045$, weight 38·18. This may be considered as the best result that can be derived from the series. Some of the differences of the results of the separate groups from the mean, which range between $+0''\cdot49$ and $-0''\cdot66$, might appear large at first glance, but they are exactly what was to be expected, if the assumption of m. e. $= \sqrt{0\cdot1}$ for weight 1 was correct. The sum of the squares of the differences multiplied by the corresponding assumed weights is 2·2646, making the m. e. for weight 1 $= \sqrt{0\cdot0985}$ instead, or $\pm\ 0''\cdot314$, whence the m. e. of the result is $\pm\ 0''\cdot051$; or the *Victoria* meridian observations give the Solar Parallax

$$\pi = 8''\cdot845, \text{ prob. err. } \pm\ 0''\cdot034.$$

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MERIDIAN OBSERVATIONS OF SAPPHO.

Of *Sappho*, 164 meridian observations were secured during the period 1889 August 30 and November 15, distributed between 14 observatories as follows :—

Berlin	18 obs.
Cambridge (Eng.)	16 „
Cape	28 „
Cincinnati	16 „
Dublin	9 „
Greenwich	9 „
Leiden	2 „
Leipzig	17 „
Melbourne	12 „
Oxford	8 „
Paris	6 „
Pulkowa	16 „
Vienna	3 „
Washington	4 „

The Berlin series includes three early observations, August 30—September 4, and two late ones made November 14 and 15; the other 159 observations were made between September 8 and November 2, when the planet's distance from the Earth did not exceed 0·95, being 0·86 when it was nearest.

Amongst these 159 observations six of the Paris observatory are included, where the planet was observed without any comparison stars. The continuous series made according to the programme therefore consists of 153 observations, in one of which the R.A. is wanting, 113 of them made in the northern hemisphere, and 40 at the two southern observatories, Cape of Good Hope and Melbourne, which co-operated in this series, with observations extending from September 10 to October 30.

Day corrections were derived for the observed Right Ascensions and Declinations by comparing the observed places of the comparison stars and reference stars with the finally adopted places contained in the table, Vol. II., p. 692–3, allowing for the magnitude equations as tabulated, Vol. II., p. 661, and the further correction of the Berlin system of R.A., so as to derive for each day the correction for the observed

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place of an $8^{m}\cdot0$-star. The observations of the planet were reduced to $8^{m}\cdot0$, taking its magnitude from the following ephemeris :

Grn. midn.	August	29	9·30	Grn. midn.	October	8	9·01
	September	8	9·16			18	9·06
		18	9·07			28	9·16
		28	9·01		November	7	9·32
						17	9·50

The mean opposition magnitude was found, from the estimates made with the present meridian observations :

from 12	estimates	at Berlin	... 10·36
„ 9	„	„ Pulkowa	... 10·31
„ 4	„	„ Dublin	... 10·39
„ 4	„	„ Oxford	... 10·47

and the mean of the first three determinations (the Oxford observations coming to hand only in 1894) : m. o. m. =10·35 was adopted to compute the ephemeris. The *B.J.* assumes the mean opposition magnitude to be 10·57, but there is no doubt that the planet was brighter during the opposition of 1889 than it would have been according to this assumption.

The observations were first compared with the ephemeris computed by Mr. Bryant, for the period September 8 to November 1, from his elements, which was published in 1889 in No. 2927 of the *Astronomische Nachrichten*. The errors of the ephemeris appearing to be large and rapidly changing, this comparison was directly used only to form normals, which were introduced into a new determination of the elements undertaken by the *Berliner Jahrbuch* office. A new ephemeris (Eph. B) was computed from them by Lieut.-Col. v. d. Groeben for the period August 30 to November 16*, with

* This ephemeris is printed in Vol. I., Part 3, p. 6, for the period September 18 to October 28. The following are the remainder of the apparent places directly computed by Lieut.-Col. v. d. Groeben from his elements :—

Berlin Midnight	R.A.	Dec.	Log. Δ	Berlin Midnight	R.A.	Dec.	Log. Δ
	h m s	° ′ ″			h m s	° ′ ″	
Aug. 30	1 11 45·541	+18 24 25·51	9·9964378	Oct. 29	0 44 17·389	+ 9 2 39·43	9·9662177
Sept. 3	12 6·943	18 17 58·13	9·9853877	Nov. 2	43 11·686	8 18 42·92	9·9767893
7	11 55·807	18 5 54·31	9·9750308	6	42 35·781	7 38 55·73	9·9884932
11	11 12·923	17 48 6·48	9·9655127	10	42 30·535	7 3 41·92	0·0011517
15	9 59·637	17 24 30·53	9·9569963	14	42 56·215	6 33 16·65	0·0145974

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which the definitive comparison of the observations, contained in the following tables, was made. For the period covered by Mr. Bryant's ephemeris however no fresh interpolation of the planet's place was made, but the old one used, adding the interpolated amount of the difference between the two ephemerides.

The following table was used in this comparison :—

Differences for Greenwich Midnight, Eph. v. d. Groeben – Eph. Bryant.

1889		Δα		Δδ		1889		Δα		Δδ	
		s		′	″			s		′	″
Sept.	8	− 3·155	− 28	− 15·09	− 0·78	Oct.	6	− 1·856	+ 9	− 1·65	+ 0·28
	9	− 3·183	+ 51	− 15·87	+ 0·02		7	− 1·847	+ 14	− 1·37	+ 0·16
	10	− 3·132	+ 100	− 15·85	+ 0·58		8	− 1·833	− 19	− 1·21	+ 0·13
	11	− 3·032	+ 116	− 15·27	+ 0·99		9	− 1·852	− 27	− 1·08	+ 0·12
	12	− 2·916	+ 132	− 14·28	+ 1·09		10	− 1·879	− 44	− 0·96	+ 0·13
	13	− 2·784	+ 113	− 13·19	+ 1·08		11	− 1·923	− 30	− 0·83	+ 0·08
	14	− 2·671	+ 89	− 12·11	+ 1·03		12	− 1·953	− 43	− 0·75	+ 0·15
	15	− 2·582	+ 59	− 11·08	+ 0·79		13	− 1·996	− 33	− 0·60	− 0·01
	16	− 2·523	+ 59	− 10·29	+ 0·58		14	− 2·029	− 46	− 0·61	+ 0·06
	17	− 2·464	+ 90	− 9·71	+ 0·52		15	− 2·075	− 55	− 0·55	+ 0·02
	18	− 2·374	+ 122	− 9·19	+ 0·40		16	− 2·130	− 41	− 0·53	+ 0·10
	19	− 2·252	+ 57	− 8·79	+ 0·31		17	− 2·171	− 33	− 0·43	− 0·04
	20	− 2·195	− 3	− 8·48	+ 0·76		18	− 2·204	− 24	− 0·47	− 0·06
	21	− 2·198	+ 27	− 7·72	+ 0·62		19	− 2·228	− 26	− 0·53	− 0·06
	22	− 2·171	+ 14	− 7·10	+ 0·36		20	− 2·254	− 71	− 0·59	− 0·34
	23	− 2·157	+ 35	− 6·74	+ 0·31		21	− 2·325	− 159	− 0·93	− 0·30
	24	− 2·122	+ 28	− 6·43	+ 0·15		22	− 2·484	+ 34	− 1·23	− 0·22
	25	− 2·094	+ 12	− 6·28	+ 0·09		23	− 2·450	− 54	− 1·45	− 0·23
	26	− 2·082	+ 17	− 6·19	+ 0·60		24	− 2·504	− 36	− 1·68	− 0·10
	27	− 2·065	+ 2	− 5·59	+ 0·60		25	− 2·540	− 37	− 1·78	− 0·16
	28	− 2·063	+ 19	− 4·99	+ 0·57		26	− 2·577	− 51	− 1·94	− 0·45
	29	− 2·044	+ 62	− 4·42	+ 0·61		27	− 2·628	− 69	− 2·39	− 0·64
	30	− 1·982	+ 65	− 3·81	+ 0·59		28	− 2·697	− 67	− 3·03	− 0·12
Oct.	1	− 1·917	+ 54	− 3·22	+ 0·46		29	− 2·764	− 87	− 3·15	− 0·25
	2	− 1·863	+ 2	− 2·76	+ 0·40		30	− 2·851	− 130	− 3·40	− 0·29
	3	− 1·861	− 3	− 2·36	+ 0·27		31	− 2·981	− 195	− 3·69	− 0·23
	4	− 1·864	− 13	− 2·09	+ 0·26	Nov.	1	− 3·176		− 3·92	
	5	− 1·877	+ 21	− 1·83	+ 0·18						

In some instances, when Mr. Bryant's differences do not run regularly, the error of the sum of the two interpolations possibly slightly exceeds $0^s{\cdot}001$ or $0^s{\cdot}002$ in R.A., and $0''{\cdot}01$ or $0''{\cdot}02$ in Dec., within which limits it generally is confined.

The arrangement of the following tables is the same as for *Victoria*, and needs no further explanation.

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Individual Observations, and Comparison with Ephemeris.

Berlin.

1889	Pos. Instr.	Obs. R.A.	No. of wires	Obs. Dec.	Div. read	Im.	Remarks
		h m s		° ′ ″			
Aug. 30	IV	1 11 46·601	25	+18 24 14·08	8	2–3	
Sept. 1	IV	12 0·971	25	18 21 38·73	8	2	Good obs.
4	II	12 7·247	25	18 15 9·04	8	3	
18	III	8 44·877	25	17 2 31·80	12	2	Hazy ; faint.
23	I	6 11·385	25	16 19 51·03	8	3	
30	I	1 47·483	25	15 7 4·79	12	2–3	
Oct. 3	II	0 59 43·630	25	14 32 5·36	12	2	
4	II	59 1·633	25	14 20 0·69	12	2–3	
6	III	57 37·130	25	13 55 20·75	8	2	Bright moon ; haze.
12	I	53 26·183	25	12 38 22·62	8	2	Good obs.
14	III	52 5·904	25	12 12 9·90	8	2–3	
15	I	51 26·759	25	11 59 2·45	8	1–2	
26	IV	45 27·171	25	9 38 44·18	8	3	Faint.
27	IV	45 2·702:	19	9 26 45·82:	8	4	Uncertain ; planet and wires scarcely visible.
Nov. 1	IV	43 26·754	24	8 30 10·85	8	2–3	
2	II	43 12·977	25	8 19 34·76	8	2	Moon ; haze.
14	IV	42 55·036	15	6 34 3·13	8	2	
15	II	43 5·968	15	6 27 12·36	8	2	Rather uncertain ; faint.

1889	Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	v′	v″	Dec. Eph. B	Red. δ / Eph.	v′	v″
	s	″		+	s	s	s	s	″	″	″	″
Aug. 30	−0·024	0·00	14	4·94	46·489	+ 0·088	−0·023	+0·002	19·78	− 0·76	−0·37	− 0·23
Sept. 1	− 22	+0·02	11	5·01	0·848	+ 0·101	− 24	+ 1	43·93	− 0·17	+0·21	+ 0·35
4	− 22	−0·05	11	5·12	7·110	+ 0·115	− 28	− 3	14·91	− 0·80	−0·42	− 0·28
18	− 23	−0·06	14	5·68	44·778	+ 0·076	− 67	− 42	39·18	− 1·76	−1·25	− 1·11
23	− 16	−0·06	11	5·87	11·264	+ 0·105	− 26	− 1	57·20	− 0·36	+0·29	+ 0·43
30	− 21	−0·03	10	6·14	47·337	+ 0·125	+ 4	+ 29	11·65	− 0·75	−0·08	+ 0·06
Oct. 3	− 21	−0·03	11	6·24	43·506	+ 0·103	− 16	+ 9	11·96	− 0·39	+0·18	+ 0·32
4	− 20	−0·02	14	6·27	1·508	+ 0·105	− 14	+ 11	7·69	− 0·75	−0·21	− 0·07
6	− 22	+0·02	11	6·33	36·997	+ 0·111	− 7	+ 18	28·05	− 0·95	−0·44	− 0·30
12	− 20	−0·03	10	6·47	26·076	+ 0·087	− 39	− 14	29·75	− 0·69	−0·08	+ 0·06
14	− 20	+0·01	14	6·50	5·761	+ 0·123	− 7	+ 18	17·27	− 0·86	−0·22	− 0·08
15	− 16	+0·03	13	6·52	26·634	+ 0·109	− 23	+ 2	9·46	− 0·46	+0·19	+ 0·33
26	− 22	−0·03	10	6·54	27·021	+ 0·128	− 6	+ 19	51·38	− 0·69	−0·02	+ 0·12
27	− 24	−0·02	10	6·53	2·682	− 0·004:	− 136:	(− 111:)	53·92	− 1·59:	−0·93:	(− 0·79:)
Nov. 1	− 21	−0·02	9	6·46	26·671	+ 0·062	− 56	− 31	17·96	− 0·67	−0·07	+ 0·07
2	− 25	−0·05	11	6·44	12·880	+ 0·072	− 43	− 18	41·49	− 0·34	+0·24	+ 0·38
14	− 25	+0·01	14	6·09	54·931	+ 0·080			9·85	− 0·62		
15	− 21	+0·02	15	6·05	5·892	+ 0·054			18·31	+ 0·12		

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Cambridge (Eng.).

1889	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α — Eph.	v′	v″	Dec. Eph. B	Red. δ — Eph.	v′	v″
	h m s	° ′ ″	s	″		+ ″	s	s	s	s	″	″	″	″
Sept. 10	1 11 25·45	+17 52 28·22	+0·023	+0·21	8	5·31	25·178	+0·295	+0·132	+0·068	34·66	—0·92	—0·53	—0·84
16	9 34·97	17 16 59·41	— 117	—0·93	13	5·55	34·654	+0·199	+ 50	— 14	4·12	—0·09	+0·37	+0·06
17	9 10·38	17 9 46·42	— 67	+0·81	12	5·59	10·040	+0·273	+ 128	+ 64	53·68	—0·86	—0·38	—0·69
20	7 46·89	16 46 9·58	— 81	—0·24	14	5·72	46·566	+0·243	+ 105	+ 41	16·43	—1·37	—0·80	—1·11
25	4 59·62	16 0 7·03	— 80	+0·28	14	5·91	59·350	+0·190	+ 63	— 1	14·06	—0·84	—0·14	—0·45
Oct. 3	0 59 42·22	14 31 39·37	— 78	—0·55	15	6·20	41·960	+0·182	+ 63	— 1	45·41	—0·39	+0·17	—0·14
7	56 53·28	13 42 19·85	— 13	+0·33	14	6·32	53·110	+0·157	+ 39	— 25	26·57	—0·07	+0·44	+0·13
8	56 11·10	13 29 38·54	— 24	—0·15	12	6·34	10·867	+0·209	+ 90	+ 26	44·99	—0·26	+0·27	—0·04
9	55 29·18	13 16 50·38	— 83	—0·25	15	6·37	28·800	+0·297	+ 177	+ 113	56·61	—0·11	+0·43	+0·12
10	54 47·30	13 3 57·19	— 114	+0·01	13	6·39	47·002	+0·184	+ 62	— 2	2·44	+1·15	+1·73	+1·42
12	53 24·71	12 37 53·76	— 17	—0·20	7	6·43	24·571	+0·122	— 4	— 68	0·78	—0·79	—0·17	—0·48
14	52 4·47	12 11 42·90	— 56	—0·69	10	6·46	4·303	+0·111	— 19	— 83	48·18	+0·49	+1·13	+0·82
21	47 50·66	10 40 30·98	— 119	+0·13	5	6·52	50·467	+0·074	— 64	— 128	38·04	—0·41	+0·27	—0·04
24	46 19·71	10 2 43·07	— 127	+0·94	12	6·52	19·430	+0·153	+ 15	— 49	51·08	—0·55	+0·13	—0·18
25	45 52·15	9 50 25·39	— 24	+0·84	12	6·51	51·981	+0·145	+ 9	— 55	32·76	—0·02	+0·66	+0·35
31	43 42·17	8 40 40·57	— 150	—1·09	10	6·44	41·729	+0·291	+ 169	+ 105	45·12	+0·80	+1·41	+1·10

Cape of Good Hope.

1889.	Obs.	M.T.C.	Obs. R.A.	Geoc. Dec. from obs.	Total Reduct.		No. st.	(Par.)	R.A. Eph. B	Red. α — Eph.	v′	v″	Dec. Eph. B	Red. δ — Eph.	v′	v″
		h m s	h m s	° ′ ″	s	″		— ″	s	s	s	s	″	″	″	″
Sept. 10	P	13 50 31	1 11 26·14	+17 52 50·05	—0·051	—0·86	10	7·43	25·832	+0·257	+0·094	+0·060	49·44	—0·25	+0·14	+0·58
11	M	13 46 22	11 12·56	17 47 50·66	— 101	—0·50	10	7·46	12·125	+0·334	+ 172	+ 199	49·58	+0·58	+0·97	+0·85
18	P	13 16 24	8 45·34	17 2 45·03	— 66	—0·63	10	7·62	45·150	+0·115	— 28	— 62	45·71	—1·31	—0·80	—0·36
19	M	13 12 0	8 17·52	16 54 55·05	— 47	—0·45	6	7·64	17·394	+0·079	— 62	— 35	54·24	+0·36	+0·90	+0·78
23	P	12 54 11	6 11·91	16 20 2·72	— 40	+0·23	10	7·68	11·745	+0·125	— 6	— 40	5·12	—2·17	—1·52	—1·08
24	M	12 49 41	5 37·19	16 10 33·04	— 51	+0·38	7	7·68	37·052	+0·087	— 42	— 15	34·20	—0·78	—0·10	—0·22
25	P	12 45 9	5 1·41	16 0 43·63	— 59	—0·51	10	7·68	1·208	+0·143	+ 16	— 18	44·64	—1·52	—0·82	—0·38
26	M	12 40 36	4 24·51	15 50 36·53	— 104	—0·59	9	7·68	24·304	+0·102	— 24	+ 3	37·12	—1·18	—0·46	—0·58
27	P	12 36 3	3 46·69	15 40 11·55	— 77	—0·78	10	7·68	46·429	+0·184	+ 59	+ 25	12·30	—1·53	—0·80	—0·36
28	M	12 31 28	3 7·80	15 29 31·33	— 49	—0·78	9	7·68	7·671	+0·080	— 43	— 16	30·87	—0·32	+0·40	+0·28
30	M	12 22 17	1 48·18	15 7 21·48	— 60	—0·77	10	7·66	47·909	+0·211	+ 90	+ 117	21·24	—0·53	+0·14	+0·02
Oct. 1	P	12 17 40	1 7·25	14 55 54·61	— 68	—0·82	11	7·64	7·097	+0·085	— 35	— 69	54·63	—0·84	—0·20	+0·24
2	M	12 13 3	0 25·96	14 44 14·31	— 39	—0·58	9	7·63	25·794	+0·127	+ 7	+ 34	14·62	—0·89	—0·29	—0·41
4	M	12 3 48	0 59 2·14	14 20 18·77	— 11	—1·06	10	7·59	2·102	+0·027	— 92	— 65	18·00	—0·29	+0·25	+0·13
5	P	11 59 10	58 20·16	14 8 3·99	— 32	—1·23	10	7·57	19·905	+0·223	+ 105	+ 71	3·20	—0·44	+0·08	+0·52
6	P	11 54 32	57 37·79	13 55 37·96	— 55	—0·18	6	7·54	37·595	+0·140	+ 22	— 12	38·62	—0·84	—0·33	+0·11
9	P	11 40 38	55 31·09	13 17 35·88	— 71	—0·59	11	7·45	30·944	+0·075	— 45	— 79	35·99	—0·70	—0·15	+0·29

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1889	Obs.	M.T.C.	Obs. R.A.	Geoc. Dec. from obs.	Total Reduct.		No. st.	(Par.)	R.A. Eph. B	Red. α — Eph.	v′	v″	Dec. Eph. B	Red. δ — Eph.	v′	v″
		h m s	h m s	° ′ ″	s	″		″	s	s	s	s	″	″	″	″
Oct. 10	M	11 36 0	0 54 49·27	+13 4 42·62	—0·125	—0·32	10	7·42	49·129	+0·016	—0·106	—0·079	42·09	+0·21	+0·79	+0·67
12	M	11 26 46	53 26·89	12 38 40·38	— 136	—0·50	10	7·34	26·652	+0·102	— 24	+ 3	40·81	—0·93	—0·31	—0·43
14	M	11 17 34	52 6·54	12 12 27·81	— 141	—0·47	10	7·26	6·319	+0·080	— 50	— 23	28·38	—1·04	—0·40	—0·52
15	P	11 12 59	51 27·43	11 59 20·78	— 14	—0·93	11	7·22	27·180	+0·236	+ 104	+ 70	20·58	—0·73	—0·08	+0·36
18	M	10 59 19	49 35·07	11 20 3·37	— 77	—0·55	9	7·07	34·914	+0·079	— 57	— 30	3·39	—0·57	+0·11	—0·01
19	P	10 54 48	48 59·53	11 7 1·88	+ 31	—0·12	11	7·02	59·493	+0·068	— 69	— 103	3·21	—1·45	—0·76	—0·32
22	M	10 41 22	47 20·46	10 28 34·09	— 84	—1·03	9	6·86	20·335	+0·041	— 98	— 71	33·43	—0·37	+0·31	+0·19
24	M	10 32 31	46 21·09	10 3 28·96	— 113	—0·93	8	6·74	20·871	+0·106	— 32	— 5	29·02	—0·99	—0·31	—0·43
25	P	10 28 7	45 53·73	9 51 9·78	— 59	—0·67	11	6·69	53·347	+0·324	+ 188	+ 154	10·21	—1·10	—0·42	+0·02
29	P	10 10 50	44 19·52	9 3 43·91	— 56	+0·32	10	6·45	19·305	+0·159	+ 32	— 2	44·97	—0·74	—0·10	+0·34
30	M	10 6 35	44 0·17	8 52 24·24	— 59	—0·11	8	6·39	0·046	+0·065	— 59	— 32	24·91	—0·78	—0·15	—0·27

[1] Excl. star δ, which differs 2″·6.

Cincinnati.

1889	Pos. Ins.	M.T.Ci.	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph. B	Red. α — Eph.	v′	Dec. Eph. B	Red. δ — Eph.	v′
		h m s	h m s	° ′ ″	s	″		+ ″	s	s	s	″	″	″
Sept. 14	E	13 32 29	1 10 14·11	+17 28 47·8	—0·016	—0·11	12	3·54	13·931	+0·163	+0·009	51·71	—0·48	—0·05
17	E	13 19 31	9 4·19	17 8 5·1	— 16	—0·08	11	3·64	4·019	+0·155	+ 10	9·56	—0·90	—0·41
20	E	13 6 19	7 39·70	16 44 12·1	+ 7	+0·74	11	3·75	39·455	+0·252	+ 115	17·71	—1·12	—0·64
24	E	12 48 23	5 27·07	16 7 44·8	— 59	—0·25	11	3·90	26·921	+0·090	— 38	47·57	+0·88	+1·57
26	E	12 39 18	4 13·76	15 47 35·8	+ 8	—0·30	11	3·97	13·575	+0·193	+ 68	40·31	—0·84	—0·11
27	W	12 34 44	3 35·57	15 37 6·9	+ 16	—0·45	13	4·01	35·437	+0·149	+ 25	10·63	—0·17	+0·56
Oct. 2	W	12 11 44	0 14·12	14 40 47·4	+ 68	+0·15	12	4·19	13·909	+0·279	+ 160	52·18	—0·44	+0·15
4	W	12 2 28	0 58 50·16	14 16 46·0	+ 15	—0·77	11	4·26	50·059	+0·116	— 2	49·02	+0·47	+1·01
8	W	11 43 56	56 1·05	13 26 40·0	+ 61	+0·18	11	4·39	0·973	+0·138	+ 18	45·18	—0·61	—0·08
9	W	11 39 18	55 19·00	13 13 48·7	+ 28	+0·64	12	4·42	18·962	+0·066	— 55	55·36	—1·60	—1·04
10	W	11 34 41	54 37·29	13 0 54·4	— 10	+0·43	11	4·44	37·238	+0·042	— 80	59·96	—0·69	—0·10
14	W	11 16 15	51 55·15	12 8 37·5	+ 16	+0·84	10	4·55	55·056	+0·110	— 20	43·25	—0·36	+0·29
15	W	11 11 41	51 16·09	11 55 31·4	+ 9	+0·16		4·57	16·137	—0·038	— 170	35·44	+0·69	+1·35
18	W	10 58 2	49 24·89	11 16 15·9	— 47	+0·32	10	4·64	24·679	+0·164	+ 27	20·03	+0·83	+1·52
29	W	10 9 37	44 13·93	9 0 24·1	+ 11	—0·32	8	4·74	13·622	+0·319	+ 193	29·23	—0·71	—0·08
31	W	10 1 9	43 38·18	8 38 4·8	— 69	+0·61	8	4·73	37·905	+0·206	+ 85	10·96	—0·82	—0·21

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Dublin.

1889	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph. B	Red. α — Eph.	r′	Dec. Eph. B	Red. δ — Eph.	r′
	h m s	° ′ ″	s	″		″+	s	s	s	″	″	″
Sept. 17[1]	1 9 9·73	+17 9 38·5	—0·027	—0·72	9	5·76	9·585	+0·118	—0·027	45·79	—2·25	—1·77
24	5 34·82	16 9 49·7	— 49	—0·17	8	6·04	34·618	+0·153	+ 24	54·16	+1·41	+2·09
Oct. 7[1]	0 56 52·52	13 42 7·9	— 39	—1·10	9	6·48	52·354	+0·127	+ 8	13·02	+0·26	+0·77
8	56 10·24	13 29 25·0	+ 6	—0·51	9	6·50	10·115	+0·131	+ 11	31·31	—0·32	+0·21
10[2]	...	13 3 38·3	...	—0·79	8	6·55	...	...	...	48·57	—4·51	—3·93
11	54 4·89	12 50 41·8	— 24	—0·95	8	6·57	4·825	+0·041	— 83	49·52	—2·10	—1·49
12	53 23·97	12 37 39·8	— 1	—0·53	9	6·59	23·843	+0·126	0	46·75	—0·89	—0·27
13[1]	52 43·57	12 24 34·6	— 3	—0·45	8	6·61	43·402	+0·165	+ 37	41·26	—0·50	+0·13
30[1]	43 59·08	8 51 31·1	— 22	—0·44	8	6·60	58·772	+0·286	+ 162	38·50	—1·24	—0·61

[1] Dark field. The results from all these observations appear entitled to diminished weight only, because all or most of the comparison stars were observed in bright field.
[2] Appeared through clouds just at edge of field (obs. excluded; it seems quite wrong from the hurry; perhaps no correction for motion of the planet is applied, which, however, would diminish the discordance to the utmost by 0″·8).

Greenwich.

1889	Obs.	M.T.Gr.	Obs. R.A.	Geoc. Dec. from obs.	Total Reduct.		No. st.	(Par.)	R.A. Eph. B	Red. α — Eph.	r′	Dec. Eph. B	Red. δ — Eph.	r′
		h m s	h m s	° ′ ″	s	″		″+	s	s	s	″	″	″
Sept. 17	RW	13 20 32	1 9 9·99	+17 9 52·00	+0·009	+0·47	10	5·49	10·034	—0·035	—0·180	53·57	—1·10	—0·62
20	AD	13 7 21	7 46·70	16 46 16·90	— 20	—0·46	7	5·61	46·558	+0·122	— 16	10·30	+0·14	+0·71
27	H	12 35 49	3 44·82	15 39 38·56	— 24	+0·64	(1)	5·89	44·460	+0·336	+ 212	39·78	—0·58	+0·15
Oct. 5	H	11 58 56	0 58 18·07	14 7 25·03	— 41	+0·10	(2)	6·16	17·735	+0·294	+ 176	25·21	—0·08	+0·44
7	AP	11 49 39	56 53·15	13 42 27·42	+ 18	—0·38	4	6·21	53·099	+0·069	— 49	26·37	+0·67	+1·18
8	L	11 45 1	56 11·00	13 29 43·74	— 34	+0·70	(1)	6·24	10·858	+0·108	— 11	44·79	—0·35	+0·18
12	L	11 26 32	53 24·75	12 37 59·29	— 37	+0·07	8	6·33	24·560	+0·153	+ 27	0·57	—1·21	—0·59
17	L	11 3 38	50 9·70	11 32 25·28	— 22	+0·81	(2)	6·40	9·495	+0·183	+ 48	26·76	—0·67	0·00
25	AD	10 27 54	45 52·23	9 50 30·34	— 33	+0·31	(1)	6·42	51·977	+0·220	+ 84	32·58	—1·93	—1·25

Leiden.

1889	Observed Place		Total Reduction		No. st.	Par.	R.A. Eph. B	Red. α — Eph.	r′	Dec. Eph. B	Red. δ — Eph.	r′
	h m s	° ′ ″	s	″		″+	s	s	s	″	″	″
Oct. 15	0 51 25·825	+11 58 43·14	+0·016	—0·26	9	6·47	25·675	+0·166	+0·034	49·97	—0·62	+0·03
30	43 59·501	8 51 51·64	+ 2	—0·31	12	6·45	59·335	+0·168	+ 44	58·76	—0·98	—0·35

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The observed R.A., as communicated, contains the observer's (B) correction for magnitude from his experiments, computed for $9^{m}\cdot2$. An extra correction of $+0^{s}\cdot006$ is necessary, therefore, for the first R.A., which is included in the "Total Red."

Leipzig.

1889	Pos. Ins.	Obs. R.A.	No. of wires	Obs. Dec.	Pointings	Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	v′	v″	Dec. Eph. B	Red. δ / Eph.	v′	v″
		h m s		° ′ ″		s	″		″+	s	s	s	s	″	″	″	″
Sept. 8	W	1 11 47·50	13	+18 1 35·75	2	—0·056	—1·16	19	5·11	47·317	+0·127	—0·033	—0·052	40·23	—0·53	—0·15	—0·02
9	W	11 37·59	14	17 57 18·92	2	— 16	—0·72	22	5·15	37·435	+0·139	— 23	— 42	23·16	+0·19	+0·58	+0·71
10	W	11 25·84	15	17 52 39·42	2	— 58	—0·51	27	5·19	25·616	+0·166	+ 3	— 16	44·55	—0·45	—0·06	+0·07
11	W	11 12·13	15	17 47 39·92	2	— 26	—0·40	22	5·23	11·878	+0·226	+ 64	+ 45	44·32	+0·43	+0·82	+0·95
15	W	9 58·40	12	17 24 0·33	3	+ 3	—0·09	22	5·39	58·326	+0·077	— 75	— 94	6·79	—1·16	—0·72	—0·59
18	W	8 44·96	7	17 2 32·43	1	— 27	—0·09	10	5·51	44·702	+0·231	+ 88	+ 69	37·90	—0·05	+0·46	+0·59
20	E	7 47·77	12	16 46 27·87	3	— 52	—0·38	27	5·59	47·594	+0·124	— 14	— 33	33·63	—0·55	+0·02	+0·15
Oct. 3	W	0 59 43·53	12	14 32 3·68	3	— 41	—0·49	17	6·07	43·390	+0·099	— 20	— 39	9·96	—0·70	—0·13	0·00
4	W	59 1·56	12	14 19 58·66	3	— 30	—0·13	12	6·11	1·390	+0·140	+ 21	+ 2	5·65	—1·01	—0·47	—0·34
12	E	53 26·23	12	12 38 20·13	3	— 74	—0·37	25	6·31	25·963	+0·193	+ 67	+ 48	27·55	—1·48	—0·86	—0·73
15	E	51 26·73	9	11 59 0·87	3	— 49	—0·65	22	6·36	26·527	+0·154	+ 22	+ 3	7·26	—0·68	—0·03	+0·10
16	E	50 48·49	12	11 45 53·22	3	— 58	—0·72	16	6·37	48·201	+0·231	+ 97	+ 78	59·83	—0·96	—0·30	—0·17
20	E	48 24·88	11	10 53 47·44	2	— 32	—0·32	10	6·40	24·632	+0·216	+ 78	+ 59	54·39	—0·87	—0·18	—0·05
23	E	46 49·57	9	10 15 37·29	2	— 75	—0·50	10	6·41	49·380	+0·115	— 24	— 43	44·34	—1·14	—0·46	—0·33
27	W	45 2·86	13	9 16 43·96	2	— 87	+0·14	15	6·39	2·615	+0·158	+ 26	+ 7	51·83	—1·34	—0·68	—0·55
30	W	43 59·91	12	8 52 7·19	3	— 47	—0·42	11	6·35	59·737	+0·126	+ 2	— 17	13·54	—0·42	+0·21	+0·34
Nov. 1	W	43 26·88	12	8 30 9·56	3	— 90	—0·55	9	6·32	26·633	+0·157	+ 39	+ 20	16·18	—0·85	—0·25	—0·12

Melbourne.

1889	Obs.	Obs. R.A.	Obs. Dec.	Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	v′	Dec. Eph. B	Red. δ / Eph.	v′
		h m s	° ′ ″	s	″		″—	s	s	s	″	″	″
Sept. 16	I	1 9 44·179	+ 17 20 0·74	—0·013	—1·89	12	7·99	44·083	+0·083	—0·067	51·33	— 0·47	— 0·02
17	P	9 20·222	17 12 58·19	+ 56	—1·84	5	8·01	20·146	+0·132	— 14	49·46	— 1·12	— 0·65
19	I	8 27·430	16 57 52·04	— 19	—2·81	11	8·05	27·326	+0·085	— 56	42·25	— 1·07	— 0·54
20	P	7 58·697	16 49 47·26	— 42	—1·60	12	8·07	58·563	+0·092	— 47	37·36	+ 0·23	+ 0·79
21	P	7 28·462	16 41 19·55	+ 35	—0·89	8	8·09	28·315	+0·182	+ 46	12·04	— 1·47	— 0·89
28	I	3 21·447	15 33 27·22	+ 16	—1·63	10	8·12	21·389	+0·074	— 50	18·11	— 0·64	+ 0·09
Oct. 1	I	1 21·533	15 0 6·92	+ 30	—2·79	9	8·10	21·497	+0·066	— 54	57·46	— 1·43	— 0·78
2	P	0 40·430	14 48 31·96	+ 45	—2·38	11	8·09	40·354	+0·121	+ 1	22·08	— 0·59	+ 0·03
3	I	0 59 58·949	14 36 43·86	+ 23	—2·53	9	8·08	58·788	+0·184	+ 65	33·86	— 0·61	— 0·03
5	I	58 34·776	14 12 32·64	— 11	—2·18	9	8·04	34·750	+0·015	— 103	22·57	— 0·15	+ 0·38
7	P	57 10·294	13 47 40·60	+ 30	—1·83	6	7·99	10·139	+0·185	+ 67	30·95	— 0·17	+ 0·34
14	P	52 20·400	12 17 13·97	+ 22	—1·60	3	7·76	20·249	+0·173	+ 44	5·12	— 0·51	+ 0·13

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Oxford (Radcliffe Observatory).

1889	Obs.	Obs. R.A.	Obs. Dec.	Total Reduction		No. st.	Par.	R.A. Eph. B	Red. α — Eph.	v′	Dec. Eph. B	Red. δ — Eph.	v′
		h m s	° ′ ″	s	″		+ ″	s	s	s	″	″	″
Sept. 10[1]	W	1 11 25·42	+ 17 52 27·37	−0·073	−0·38	3	5·25	25·130	+0·217	+0·054	33·55	− 1·31	− 0·92
20[1]	W	7 46·69	16 46 8·23	+ 8	+0·58	3	5·65	46·453	+0·245	+ 107	14·54	− 0·08	+ 0·49
25[2]	R	4 59·32	16 0 5·92	− 11	−0·47	4	5·85	59·213	+0·096	− 31	11·80	− 0·50	+ 0·20
28	R	3 5·64	15 28 48·39	− 41	+0·03	(2)	5·96	5·524	+0·075	− 48	55·25	− 0·90	− 0·18
Oct. 5	R	0 58 17·82	14 7 16·66	− 53	−0·70	3	6·20	17·587	+0·180	+ 62	22·62	− 0·46	+ 0·06
8[3]	W	56 10·94	13 29 35·81	− 15	−0·48	(1)	6·28	10·709	+0·216	+ 97	42·11	− 0·50	+ 0·03
9	R	55 28·84	13 16 46·72	− 190	−0·08	3	6·30	28·643	+0·007	− 113	53·70	− 0·76	− 0·21
29[1]	R	44 18·32	9 3 0·56	− 45	−0·76	3	6·42	18·204	+0·071	− 56	7·34	− 1·12	− 0·48

[1] Exceedingly faint. [2] Difficult. [3] Very faint; close to Moon.

Paris (Grand Instrument Méridien).

1889	M.T.Par.	Observed Place		Par.	R.A. Eph. B	Obs. — Eph.	Approx. Red.	v′	Dec. Eph. B	Obs. — Eph.	Approx. Red.	v′
	h m s	h m s	° ′ ″	+ ″	s	s	s	s	″	″	″	″
Oct. 22	10 41 10	0 47 19·07	+10 27 54·0	6·08	18·936	+0·134	+0·07	+0·065	59·36	+0·72	−1·12	+0·28
23	10 36 43	46 48·72	10 15 20·1	6·08	48·552	+0·168	+0·07	+ 99	23·35	+2·83	−1·12	+2·39
25	10 27 55	45 52·15	9 50 31·3	6·08	52·150	0·000	+0·07	− 66	37·34	+0·04	−1·12	−0·40
28	10 14 55	44 39·38	9 14 40·4	6·06	39·332	+0·048	+0·07	− 12	46·85	−0·39	−1·12	−0·86
29	10 10 38	44 18·38	9 3 9·0	6·05	18·405	−0·025	+0·07	− 82	14·21	+0·84	−1·12	+0·36
30	10 6 23	43 59·32	8 51 49·1	6·04	59·226	+0·094	+0·07	+ 40	54·75	+0·39	−1·12	−0·10

An approximate reduction has been applied to the differences Obs. – Eph., so as to make the mean agree with the mean of the other observations on the same days, in order to make the series useful in the determination of the variation of the ephemeris error October 22 to 30.

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Pulkowa.

1889	M.T.Pu.	Obs. R.A.	No. of wires	Obs. Dec.	Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	v′	Dec. Eph. B	Red. δ / Eph.	r′	r″
	h m s	h m s		° ′ ″	s	″		″+	s	s	s	″	″	″	″
Sept. 17	13 20 54	1 9 12·29	7	+17 10 24·46	+0·045	+0·45	12	6·60	12·170	+0·165	+0·020	31·16	+0·35	+0·83	+0·31
18	13 16 32	8 46·17	8	17 2 54·18	— 8	+0·67	13	6·64	46·045	+0·117	— 26	0·86	+0·63	+1·13	+0·61
22[1]	12 58 49	6 46·33	7	16 29 28·04	— 23	+0·39	12	6·81	46·283	+0·024	— 109	35·06	+0·18	+0·80	+0·28
24	12 49 50	5 38·28	7	16 10 45·97	— 19	+0·22	12	6·89	38·213	+0·048	— 81	53·30	—0·22	+0·46	—0·06
25[2]	12 45 18	5 2·69	5	16 0 55·21	+ 25	+0·31	10	6·93	2·406	+0·309	+ 182	4·33	—1·88	—1·18	—1·70
28	12 31 37	3 8·97	7	15 29 45·31	+ 132	+0·13	12	7·04	8·960	+0·142	+ 19	52·24	+0·24	+0·96	+0·44
29	12 27 2	2 29·45	3	15 18 48·11	— 16	+0·52	5	7·08	29·445	—0·011	— 133	55·47	+0·24	+0·94	+0·42
Oct. 2	12 13 12	0 27·25	7	14 44 30·64	— 85	—0·27	12	7·18	27·159	+0·006	— 114	37·86	—0·31	+0·29	—0·23
3	12 8 35	0 59 45·57	7	14 32 36·43	+ 14	+0·36	11	7·21	45·473	+0·111	— 8	45·73	—1·73	—1·16	—1·68
4	12 3 57	59 3·59	7	14 20 33·51	+ 77	+0·04	10	7·23	3·487	+0·180	+ 61	41·99	—1·21	—0·67	—1·19
5	11 59 19	58 21·40	5	14 8 21·06	+ 77	+0·28	11	7·26	21·295	+0·182	+ 64	27·53	+1·07	+1·59	+1·07
9	11 40 47	55 32·45	7	13 17 52·93	+ 76	+1·14	13	7·34	32·323	+0·203	+ 83	1·36	+0·05	+0·60	+0·08
14	11 17 43	52 7·62	7	12 12 44·89	— 65	+0·64	12	7·43	7·617	—0·062	— 192	54·30	—1·34	—0·70	—1·22
23	10 37 4	46 51·09	7	10 16 14·48	+ 19	+0·14	11	7·42	50·864	+0·245	+ 106	21·81	+0·23	+0·91	+0·39
25	10 28 16	45 54·27	7	9 51 27·39	+ 27	+0·14	10	7·40	54·216	+0·081	— 55	34·37	+0·56	+1·24	+0·72
27[1]	10 19 34	45 4·03	6	9 27 21·27	— 47	+0·39	12	7·37	3·769	+0·214	+ 82	27·39	+1·64	+2·30	+1·78

[1] Very unsteady and diffused. [2] Difficult.

Vienna (v. Kuffner's Observatory).

1889	Obs.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	r′	Dec. Eph. B	Red. δ / Eph.	v′
		h m s	° ′ ″	s	″		″+	s	s	s	″	″	″
Sept. 14	O	1 10 19·778	+17 30 33·50	+0·052	—0·85	11	4·91	19·654	+0·176	+0·021	37·70	—0·14	+0·28
16	O	9 35·880	17 17 18·43	+0·018	—0·13	10	4·98	35·722	+0·176	+0·027	22·99	+0·29	+0·75
19	O	8 17·433	16 54 47·58	—0·052	—0·16	12	5·10	17·220	+0·161	+0·020	51·31	+1·21	+1·75

Washington.

1889	Obs.	Observed Place		Total Reduct.		No. st.	Par.	R.A. Eph. B	Red. α / Eph.	r′	Dec. Eph. B	Red. δ / Eph.	v′
		h m s	° ′ ″	s	″		″+	s	s	s	″	″	″
Sept. 21	S	1 7 9·29	+16 35 46·9	—0·096	—0·92	11	3·75	8·950	+0·244	+0·109	50·31	—0·58	+0·02
27	S	3 36·33	15 37 22·0	—0·002	—0·81	11	3·96	36·226	+0·102	—0·022	23·68	+1·47	+2·20
Oct. 2	S	0 15·11	14 41 4·9	—0·130	—0·14	11	4·15	14·764	+0·216	+0·097	6·73	+2·18	+2·77
17	S	0 50 1·95	11 29 32·7	—0·074	—0·45	12	4·58	1·615	+0·261	+0·125	38·83	—2·00	—1·32

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Table of Observed Corrections of Eph. B = $\Delta\alpha$ and $\Delta\delta$, and Outstanding Apparent Errors v'.

Epoch M. T. Gr.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N.	$\Delta\delta$ S.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	″	″		″
August	30·56	B	+ 0·088	1·77	— 0·023	— 0·76		0·84	— 0·37
September	1·56	B	+ 0·101	1·74	— 0·024	— 0·17		0·82	+ 0·21
	4·55	B	+ 0·115	1·74	— 0·028	— 0·80		0·62	— 0·42
	8·54	Lz	+ 0·127	0·28	— 0·033	— 0·53		0·19	— 0·15
	9·54	Lz	+ 0·139	0·29	— 0·023	+ 0·19		0·19	+ 0·58
	10·52	Cp	+ 0·257	0·36	+ 0·094		— 0·25	0·36	+ 0·14
	54	Lz	+ 166	0·29	+ 3	— 0·45		0·19	— 0·06
	57	Cb	+ 295	0·18	+ 132	— 0·92		0·18	— 0·53
	57	O	+ 217	0·15	+ 54	— 1·31		0·15	— 0·92
	11·52	Cp	+ 0·334	0·36	+ 0·172		+ 0·58	0·36	+ 0·97
	53	Lz	+ 226	0·29	+ 64	+ 0·43		0·19	+ 0·82
	14·51	Vi	+ 0·176	0·27	+ 0·021	— 0·14		0·09	+ 0·28
	79	Ci	+ 163	0·09	+ 9	— 0·48		0·09	— 0·05
	15·52	Lz	+ 0·077	0·29	— 0·075	— 1·16		0·19	— 0·72
	16·15	M	+ 0·083	0·28	— 0·067		— 0·47	0·08	— 0·02
	51	Vi	+ 176	0·27	+ 27	+ 0·29		0·09	+ 0·75
	55	Cb	+ 199	0·19	+ 50	— 0·09		0·19	+ 0·37
	17·15	M	+ 0·132	0·25	— 0·014		— 1·12	0·17	— 0·65
	47	Pu	+ 165	0·18	+ 20	+ 0·35		0·28	+ 0·83
	55	Cb	+ 273	0·18	+ 128	— 0·86		0·18	— 0·38
	55	Gr	— 35	0·27	— 180	— 1·10		0·18	— 0·62
	57	D	+ 118	0·18	— 27	— 2·25		0·12	— 1·77
	78	Ci	+ 155	0·09	+ 10	— 0·90		0·09	— 0·41
	18·46	Pu	+ 0·117	0·19	— 0·026	+ 0·63		0·28	+ 1·13
	50	Cp	+ 115	0·36	— 28		— 1·31	0·36	— 0·80
	51	B	+ 76	1·33	— 67	— 1·76		0·63	— 1·25
	51	Lz	+ 231	0·27	+ 88	— 0·05		0·09	+ 0·46
	19·14	M	+ 0·085	0·37	— 0·056		— 1·07	0·27	— 0·54
	49	Cp	+ 79	0·34	— 62		+ 0·36	0·34	+ 0·90
	50	Vi	+ 161	0·28	+ 20	+ 1·21		0·09	+ 1·75
	20·14	M	+ 0·092	0·18	— 0·047		+ 0·23	0·28	+ 0·79
	51	Lz	+ 124	0·29	— 14	— 0·55		0·19	+ 0·02
	54	Cb	+ 243	0·19	+ 105	— 1·37		0·19	— 0·80
	54	Gr	+ 122	0·26	— 16	+ 0·14		0·17	+ 0·71
	55	O	+ 245	0·15	+ 107	— 0·08		0·15	+ 0·49
	78	Ci	+ 252	0·09	+ 115	— 1·12		0·09	— 0·64
	21·14	M	+ 0·182	0·18	+ 0·046		— 1·47	0·13	— 0·89
	75	Wa	+ 244	0·16	+ 109	— 0·58		0·09	+ 0·02
	22·45	Pu	+ 0·024	0·14	— 0·109	+ 0·18		0·21	+ 0·80

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Epoch M. T. Gr.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N.	$\Delta\delta$ S.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	″	″		″
September	23·48	Cp	+ 0·125	0·36	— 0·006		— 2·17	0·36	— 1·52
	50	B	105	1·74	— 26	— 0·36		0·82	+ 0·29
	24·45	Pu	+ 0·048	0·18	— 0·081	— 0·22		0·28	+ 0·46
	48	Cp	+ 87	0·35	— 42		— 0·78	0·35	— 0·10
	55	D	+ 153	0·27	+ 24	+ 1·41		0·18	+ 2·09
	76	Ci	+ 90	0·09	— 38	+ 0·88		0·09	+ 1·57
	25·44	Pu	+ 0·309	0·14	+ 0·182	— 1·88		0·20	— 1·18
	47·	Cp	+ 143	0·36	+ 16		— 1·52	0·36	— 0·82
	53	Cb	+ 190	0·19	+ 63	— 0·84		0·19	— 0·14
	53	O	+ 96	0·24	— 31	— 0·50		0·24	+ 0·20
	26·47	Cp	+ 0·102	0·36	— 0·024		— 1·18	0·36	— 0·46
	76	Ci	+ 193	0·09	+ 68	— 0·84		0·09	— 0·11
	27·47	Cp	+ 0·184	0·36	+ 0·059		— 1·53	0·36	— 0·80
	52	Gr	+ 336	0·15	+ 212	— 0·58		0·10	+ 0·15
	73	Wa	+ 102	0·46	— 22	+ 1·47		0·09	+ 2·20
	75	Ci	+ 149	0·09	+ 25	— 0·17		0·09	+ 0·56
	28·12	M	+ 0·074	0·37	— 0·050		— 0·64	0·27	+ 0·09
	43	Pu	+ 142	0·18	+ 19	+ 0·24		0·28	+ 0·96
	47	Cp	+ 80	0·36	— 43		— 0·32	0·36	+ 0·40
	52	O	+ 75	0·18	— 48	— 0·90		0·18	— 0·18
	29·43	Pu	— 0·011	0·08	— 0·133	+ 0·24		0·24	+ 0·94
	30·46	Cp	+ 0·211	0·36	+ 0·090		— 0·53	0·36	+ 0·14
	47	B	+ 125	1·73	+ 4	— 0·75		0·82	— 0·08
October	1·11	M	+ 0·066	0·36	— 0·054		— 1·43	0·27	— 0·78
	46	Cp	+ 85	0·36	— 35		— 0·84	0·36	— 0·20
	2·10	M	+ 0·121	0·37	+ 0·001		— 0·59	0·27	+ 0·03
	42	Pu	+ 6	0·18	— 114	— 0·31		0·28	+ 0·29
	45	Cp	+ 127	0·36	+ 7		— 0·89	0·36	— 0·29
	72	Wa	+ 216	0·46	+ 97	+ 2·18		0·09	+ 2·77
	74	Ci	+ 279	0·09	+ 160	— 0·44		0·09	+ 0·15
	3·10	M	+ 0·184	0·36	+ 0·065		— 0·61	0·27	— 0·03
	42	Pu	+ 111	0·18	— 8	— 1·73		0·27	— 1·16
	46	B	+ 103	1·74	— 16	— 0·39		0·82	+ 0·18
	47	Lz	+ 99	0·29	— 20	— 0·70		0·19	— 0·13
	50	Cb	+ 182	0·19	+ 63	— 0·39		0·19	+ 0·17
	4·41	Pu	+ 0·180	0·18	+ 0·061	— 1·21		0·27	— 0·67
	45	Cp	+ 27	0·36	— 92		— 0·29	0·36	+ 0·25
	46	B	+ 105	1·75	— 14	— 0·75		0·84	— 0·21
	46	Lz	+ 140	0·28	+ 21	— 1·01		0·18	— 0·47
	73	Ci	+ 116	0·09	— 2	+ 0·47		0·09	+ 1·01
	5·09	M	+ 0·015	0·36	— 0·103		— 0·15	0·27	+ 0·38
	41	Pu	+ 182	0·18	+ 64	+ 1·07		0·27	+ 1·59
	44	Cp	+ 223	0·36	+ 105		— 0·44	0·36	+ 0·08
	49	Gr	+ 294	0·19	+ 176	— 0·08		0·12	+ 0·44
	50	O	+ 180	0·22	+ 62	— 0·46		0·22	+ 0·06

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Epoch M. T. Gr.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N.	$\Delta\delta$ S.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	″	″		″
October	6·44	Cp	+ 0·140	0·34	+ 0·022		− 0·84	0·34	− 0·33
	45	B	+ 111	1·30	− 7	− 0·95		0·62	− 0·44
	7·09	M	+ 0·185	0·34	+ 0·067		− 0·17	0·17	+ 0·34
	49	Cb	+ 157	0·19	+ 39	− 0·07		0·19	+ 0·44
	49	Gr	+ 69	0·24	− 49	+ 0·67		0·16	+ 1·18
	51	D	+ 127	0·18	+ 8	+ 0·26		0·12	+ 0·77
	8·48	Cb	+ 0·209	0·18	+ 0·090	− 0·26		0·18	+ 0·27
	48	Gr	+ 108	0·15	− 11	− 0·35		0·10	+ 0·18
	49	O	+ 216	0·13	+ 97	− 0·50		0·13	+ 0·03
	50	D	+ 131	0·27	+ 11	− 0·32		0·18	+ 0·21
	72	Ci	+ 138	0·09	+ 18	− 0·61		0·09	− 0·08
	9·40	Pu	+ 0·203	0·19	+ 0·083	+ 0·05		0·28	+ 0·60
	43	Cp	+ 75	0·36	− 45		− 0·70	0·36	− 0·15
	48	Cb	+ 297	0·19	+ 177	− 0·11		0·19	+ 0·43
	48	O	+ 7	0·22	− 113	− 0·76		0·12	− 0·21
	72	Ci	+ 66	0·09	− 55	− 1·60		0·09	− 1·04
	10·43	Cp	+ 0·016	0·36	− 0·106		+ 0·21	0·36	+ 0·79
	48	Cb	+ 184	0·19	+ 62	+ 1·15		0·19	+ 1·73
	50	D	...	...	...	[− 4·51		0·09	− 3·93]
	71	Ci	+ 42	0·09	− 80	− 0·69		0·09	− 0·10
	11·49	D	+ 0·041	0·27	− 0·083	− 2·10		0·18	− 1·49
	12·42	Cp	+ 0·102	0·36	− 0·024		− 0·93	0·36	− 0·31
	43	B	+ 87	1·73	− 39	− 0·69		0·82	− 0·08
	44	Lz	+ 193	0·29	+ 67	− 1·48		0·19	− 0·86
	47	Cb	+ 122	0·17	− 4	− 0·79		0·17	− 0·17
	47	Gr	+ 153	0·26	+ 27	− 1·21		0·17	− 0·59
	49	D	+ 126	0·27	0	− 0·89		0·18	− 0·27
	13·49	D	+ 0·165	0·18	+ 0·037	− 0·50		0·12	+ 0·13
	14·06	M	+ 0·173	0·30	+ 0·044		− 0·51	0·22	+ 0·13
	38	Pu	− 62	0·18	− 192	− 1·34		0·28	− 0·70
	41	Cp	+ 80	0·36	− 50		− 1·04	0·36	− 0·40
	43	B	+ 123	1·77	− 7	− 0·86		0·84	− 0·22
	47	Cb	+ 111	0·18	− 19	+ 0·49		0·18	+ 1·13
	70	Ci	+ 110	0·09	− 20	− 0·36		0·09	+ 0·29
	15·41	Cp	+ 0·236	0·36	+ 0·104		− 0·73	0·36	− 0·08
	43	B	+ 109	1·76	− 23	− 0·46		0·84	+ 0·19
	43	Lz	+ 154	0·29	+ 22	− 0·68		0·19	− 0·03
	45	Ld	+ 166	1·17	+ 34	− 0·62		0·45	+ 0·03
	70	Ci	− 38	0·05	− 170	+ 0·69		0·05	+ 1·35
	16·42	Lz	+ 0·231	0·28	+ 0·097	− 0·96		0·19	− 0·30
	17·46	Gr	+ 0·183	0·19	+ 0·048	− 0·67		0·19	0·00
	67	Wa	+ 261	0·46	+ 125	− 2·00		0·09	− 1·32

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Epoch M. T. Gr.		Obs.	$\Delta\alpha$	p	v'	$\Delta\delta$ N.	$\Delta\delta$ S.	$\Delta\delta$ p	$\Delta\delta$ v'
			s		s	"	"		"
October	18·40	Cp	+ 0·079	0·36	− 0·057		− 0·57	0·36	+ 0·11
	69	Ci	+ 164	0·09	+ 27	+ 0·83		0·09	+ 1·52
	19·40	Cp	+ 0·068	0·36	− 0·069		− 1·45	0·36	− 0·76
	20·41	Lz	+ 0·216	0·27	+ 0·078	− 0·87		0·18	− 0·18
	21·44	Cb	+ 0·074	0·19	− 0·064	− 0·41		0·17	+ 0·27
	22·39	Cp	+ 0·041	0·36	− 0·098		− 0·37	0·36	+ 0·31
	43	Pa	+ 204	0·05	+ 65	− 0·40		0·10	+ 0·28
	23·35	Pu	+ 0·245	0·18	+ 0·106	+ 0·23		0·27	+ 0·91
	40	Lz	+ 115	0·27	− 24	− 1·14		0·18	− 0·46
	43	Pa	+ 238	0·05	+ 99	+ 1·71		0·10	+ 2·39
	24·38	Cp	+ 0·106	0·36	− 0·032		− 0·99	0·36	− 0·31
	43	Cb	+ 153	0·18	+ 15	− 0·55		0·18	+ 0·13
	25·35	Pu	+ 0·081	0·18	− 0·055	+ 0·56		0·27	+ 1·24
	38	Cp	+ 324	0·36	+ 188		− 1·10	0·36	− 0·42
	42	Pa	+ 70	0·05	− 66	− 1·08		0·10	− 0·40
	43	Cb	+ 145	0·18	+ 9	− 0·02		0·18	+ 0·66
	43	Gr	+ 220	0·15	+ 84	− 1·93		0·10	− 1·25
	26·39	B	+ 0·128	1·29	− 0·006	− 0·69		0·61	− 0·02
	27·34	Pu	+ 0·214	0·14	+ 0·082	+ 1·64		0·21	+ 2·30
	39	B	− 4:	0·86	− 136:	− 1·59:		0·41	− 0·93:
	39	Lz	+ 158	0·28	+ 26	− 1·34		0·19	− 0·68
	28·42	Pa	+ 0·118	0·05	− 0·012	− 1·51		0·10	− 0·86
	29·37	Cp	+ 0·159	0·36	+ 0·032		− 0·74	0·36	− 0·10
	41	Pa	+ 45	0·05	− 82	− 0·28		0·10	+ 0·36
	58	O	+ 71	0·15	− 56	− 1·12		0·15	− 0·48
	65	Ci	+ 319	0·09	+ 193	− 0·71		0·09	− 0·08
	30·36	Cp	+ 0·065	0·36	− 0·059		− 0·78	0·36	− 0·15
	38	Lz	+ 126	0·27	+ 2	− 0·42		0·18	+ 0·21
	40	Ld	+ 168	1·22	+ 44	− 0·98		0·46	− 0·35
	41	Pa	+ 164	0·05	+ 40	− 0·73		0·10	− 0·10
	43	D	+ 286	0·18	+ 162	− 1·24		0·12	− 0·61
	31·41	Cb	+ 0·291	0·18	+ 0·169	+ 0·80		0·18	+ 1·41
	65	Ci	+ 206	0·09	+ 85	− 0·82		0·09	− 0·21
November	1·37	B	+ 0·062	1·71	− 0·056	− 0·67		0·81	− 0·07
	38	Lz	+ 157	0·27	+ 39	− 0·85		0·18	− 0·25
	2·37	B	+ 0·072	1·30	− 0·043	− 0·34		0·62	+ 0·24
	14·34	B	+ 0·080	1·77		− 0·62		0·84	
	15·33	B	+ 0·054	1·33		+ 0·12		0·63	

The weights p are computed adopting the weights of an observation tabulated Vol. II., p. 702–3, diminishing the computed quantities in some cases when notes

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appended to the observation seemed to indicate a lesser weight, and for those $\Delta\alpha$ and $\Delta\delta$, which, for want of comparison stars, depend upon general reductions. With these weights, the following daily means are found :—

Table of Daily Means of Observed Corrections to Ephemeris B.

Epoch M. T. Gr.		$\Delta\alpha$	p	Epoch M. T. Gr.		$\Delta\delta$	p	Error v' in R.A.	Error v' in Dec.	No. obs.
		s				″		s	″	
Aug.	30·56	+ 0·088	1·77	Aug.	30·56	— 0·76	0·84	— 0·023	— 0·37	1
Sept.	1·56	+ 0·101	1·74	Sept.	1·56	— 0·17	0·82	— 0·024	+ 0·21	1
	4·55	+ 0·115	1·74	Sept.	4·55	— 0·80	0·62	— 0·028	— 0·42	1
Sept.	8·54	+ 0·127	0·28	Sept.	8·54	— 0·53	0·19	— 0·033	— 0·15	1
	9·54	+ 0·139	0·29		9·54	+ 0·19	0·19	— 0·023	+ 0·58	1
	10·54	+ 0·231	0·98		10·54	— 0·61	0·88	+ 0·068	— 0·22	4
	11·52	+ 0·286	0·65		11·52	+ 0·53	0·55	+ 0·124	+ 0·92	2
Sept.	14·58	+ 0·174	0·36	Sept.	14·60	— 0·31	0·18	+ 0·019	+ 0·11	2
	15·52	+ 0·077	0·29		15·52	— 1·16	0·19	— 0·075	— 0·72	1
	16·39	+ 0·147	0·74		16·45	— 0·08	0·36	— 0·002	+ 0·38	3
	17·47	+ 0·120	1·15		17·38	— 0·78	1·02	— 0·026	— 0·30	6
Sept.	18·50	+ 0·105	2·15	Sept.	18·50	— 1·03	1·36	— 0·038	— 0·53	4
	19·36	+ 0·106	0·99		19·35	— 0·08	0·70	— 0·035	+ 0·45	3
	20·49	+ 0·167	1·16		20·46	— 0·36	1·07	+ 0·029	+ 0·21	6
Sept.	21·43	+ 0·211	0·34	Sept.	21·39	— 1·11	0·22	+ 0·075	— 0·52	2
	22·45	+ 0·024	0·14		22·45	+ 0·18	0·21	— 0·109	+ 0·80	1
	23·50	+ 0·108	2·10		23·49	— 0·90	1·18	— 0·023	— 0·25	2
	24·52	+ 0·100	0·89		24·51	— 0·08	0·90	— 0·029	+ 0·60	4
Sept.	25·50	+ 0·166	0·93	Sept.	25·49	— 1·22	0·99	+ 0·039	— 0·52	4
	26·53	+ 0·120	0·45		26·53	— 1·12	0·45	— 0·005	— 0·40	2
	27·61	+ 0·166	1·06		27·54	— 0·77	0·64	+ 0·042	— 0·04	4
	28·36	+ 0·087	1·09		28·38	— 0·35	1·09	— 0·036	+ 0·37	4
Sept.	29·43	— 0·011	0·08	Sept.	29·43	+ 0·24	0·24	— 0·133	+ 0·94	1
	30·47	+ 0·140	2·09		30·47	— 0·68	1·18	+ 0·019	— 0·01	2
Oct.	1·28	+ 0·076	0·72	Oct.	1·31	— 1·09	0·63	— 0·044	— 0·45	2
	2·47	+ 0·148	1·46		2·40	— 0·38	1·09	+ 0·028	+ 0·22	5
Oct.	3·41	+ 0·119	2·76	Oct.	3·40	— 0·67	1·74	0·000	— 0·10	5
	4·46	+ 0·103	2·66		4·46	— 0·69	1·74	— 0·016	— 0·15	5
	5·36	+ 0·163	1·31		5·37	— 0·02	1·24	+ 0·045	+ 0·50	5
Oct.	6·45	+ 0·117	1·64	Oct.	6·45	— 0·91	0·96	— 0·001	— 0·40	2
	7·35	+ 0·151	0·95		7·39	+ 0·15	0·64	+ 0·033	+ 0·66	4
	8·51	+ 0·157	0·82		8·52	— 0·38	0·68	+ 0·037	+ 0·15	5
	9·49	+ 0·124	1·05		9·46	— 0·47	1·04	+ 0·004	+ 0·08	5
Oct.	10·48	+ 0·070	0·64	Oct.	10·49	+ 0·36	0·64	— 0·052	+ 0·94	3
	11·49	+ 0·041	0·27		11·49	— 2·10	0·18	— 0·083	— 1·49	1
	12·44	+ 0·110	3·08		12·44	— 0·90	1·89	— 0·016	— 0·28	6
	13·49	+ 0·165	0·18		13·49	— 0·50	0·12	+ 0·037	+ 0·13	1

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Epoch M. T. Gr.		$\Delta\alpha$	p	Epoch M. T. Gr.		$\Delta\delta$	p	Error v' in R.A.	Error v' in Dec.	No. obs.
		s				″		s	″	
Oct.	14·40	+ 0·109	2·88	Oct.	14·39	− 0·78	1·97	− 0·021	− 0·14	6
	15·44	+ 0·147	3·63		15·44	− 0·54	1·89	+ 0·015	+ 0·11	5
Oct.	16·42	+ 0·231	0·28	Oct.	16·42	− 0·96	0·19	+ 0·097	− 0·30	1
	17·61	+ 0·238	0·65		17·53	− 1·10	0·28	+ 0·102	− 0·43	2
	18·46	+ 0·096	0·45		18·46	− 0·29	0·45	− 0·040	+ 0·39	2
	19·40	+ 0·068	0·36		19·40	− 1·45	0·36	− 0·069	− 0·76	1
Oct.	20·41	+ 0·216	0·27	Oct.	20·41	− 0·87	0·18	+ 0·078	− 0·18	1
	21·44	+ 0·074	0·19		21·44	− 0·41	0·17	− 0·064	+ 0·27	1
	22·40	+ 0·061	0·41		22·40	− 0·38	0·46	− 0·078	+ 0·30	2
	23·39	+ 0·174	0·50		23·38	+ 0·05	0·55	+ 0·035	+ 0·73	3
Oct.	24·40	+ 0·122	0·54	Oct.	24·40	− 0·84	0·54	− 0·016	− 0·16	2
	25·40	+ 0·210	0·92		25·39	− 0·54	1·01	+ 0·074	+ 0·14	5
	26·39	+ 0·128	1·29		26·39	− 0·69	0·61	− 0·006	− 0·02	1
	27·38	+ 0·056	1·28		27·38	− 0·70	0·81	− 0·076	− 0·04	3
Oct.	28·42	+ 0·118	0·05	Oct.	28·42	− 1·51	0·10	− 0·012	− 0·86	1
	29·47	+ 0·152	0·65		29·41	− 0·75	0·70	+ 0·025	− 0·11	4
	30·39	+ 0·150	2·08		30·39	− 0·85	1·22	+ 0·026	− 0·22	5
Oct.	31·49	+ 0·263	0·27	Oct.	31·49	+ 0·26	0·27	+ 0·141	+ 0·87	2
Nov.	1·37	+ 0·075	1·98	Nov.	1·37	− 0·70	0·99	− 0·043	− 0·10	2
	2·37	+ 0·072	1·30		2·37	− 0·34	0·62	− 0·043	+ 0·24	1
Nov.	14·34	+ 0·080	1·77	Nov.	14·34	− 0·62	0·84			1
	15·33	+ 0·054	1·33		15·33	+ 0·12	0·63			1

Means for Groups of Consecutive Days.

Ep. R.A.		$\Delta\alpha$	p	Ep. Dec.		$\Delta\delta$	p	No. obs.	App. Error v'		M.O. — Gill	
		s				″			s	″	s	″
Sept.	1·88	+ 0·101	5·25	Sept.	1·64	− 0·56	2·48	3	− 0·026	− 0·18	(+ 0·052	+ 0·22)
	10·45	+ 0·222	2·20		10·52	− 0·17	1·81	8	+ 0·060	+ 0·22	(+ 0·142	+ 0·44)
	16·46	+ 0·131	2·54		16·68	− 0·63	1·75	12	− 0·018	− 0·17	(+ 0·034	− 0·11)
	19·23	+ 0·121	4·30		19·36	− 0·59	3·13	13	− 0·020	− 0·06	+ 0·018	− 0·10
	23·51	+ 0·122	3·47		23·59	− 0·54	2·51	9	− 0·009	+ 0·12	+ 0·016	− 0·10
	27·12	+ 0·136	3·53		27·59	− 0·81	3·17	14	+ 0·011	− 0·08	+ 0·020	− 0·40
Oct.	1·26	+ 0·129	4·35	Oct.	1·54	− 0·59	3·14	10	+ 0·009	+ 0·04	+ 0·009	− 0·20
	4·21	+ 0·121	6·73		4·31	− 0·51	4·72	15	+ 0·002	+ 0·03	0·000	− 0·13
	7·73	+ 0·133	4·46		8·00	− 0·46	3·32	16	+ 0·014	+ 0·06	+ 0·011	− 0·09
	12·12	+ 0·102	4·17		11·98	− 0·67	2·83	11	− 0·023	− 0·05	− 0·019	− 0·30
	14·98	+ 0·130	6·51		14·90	− 0·66	3·86	11	− 0·001	− 0·01	+ 0·010	− 0·29
	18·00	+ 0·166	1·74		18·21	− 0·89	1·28	6	+ 0·030	− 0·21	+ 0·050	− 0·51
	22·25	+ 0·134	1·37		22·40	− 0·27	1·36	7	− 0·005	+ 0·41	+ 0·024	+ 0·13
	26·21	+ 0·123	4·03		25·96	− 0·67	2·97	11	− 0·012	0·00	+ 0·020	− 0·24
	30·14	+ 0·150	2·78		29·95	− 0·85	2·02	10	+ 0·025	− 0·22	(+ 0·055	− 0·38)
Nov.	1·67	+ 0·088	3·55	Nov.	1·56	− 0·45	1·88	5	− 0·029	+ 0·14	(0·000	+ 0·05)
	14·77	+ 0·069	3·10		14·76	− 0·30	1·47	2			(+ 0·026	+ 0·40)

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Scarcely any variation of ephemeris error can be recognised with certainty in the comparison. The only tolerably established fact seems to be a diminution of the error in both co-ordinates after the end of October. A graphical interpolation however has been tried, which leaves the outstanding apparent errors v' in this and the preceding tables, and gives the following

Adopted Corrections of Ephemeris B from Meridian Observations.

For Greenwich Mean Noon.

		s	″			s	″			s	″
Aug.	30	+ 0·107	− 0·39	Sept.	21	+ 0·137	− 0·58	Oct.	13	+ 0·127	− 0·63
	31	114	39		22	134	61		14	129	64
Sept.	1	122	39		23	132	64		15	131	65
	2	128	38		24	130	67		16	133	66
	3	134	38		25	128	69		17	135	67
	4	140	38		26	126	71		18	136	68
	5	145	38		27	125	73		19	137	69
	6	150	38		28	124	73		20	138	69
	7	155	38		29	122	71		21	138	68
	8	158	38		30	121	69		22	139	68
	9	161	38	Oct.	1	120	65		23	139	68
	10	162	39		2	120	62		24	138	68
	11	163	39		3	119	58		25	137	68
	12	162	39		4	119	55		26	135	67
	13	160	40		5	118	53		27	133	66
	14	156	41		6	118	51		28	131	65
	15	154	43		7	118	51		29	128	64
	16	151	45		8	119	52		30	125	63
	17	147	47		9	120	54		31	123	62
	18	144	49		10	121	57	Nov.	1	120	60
	19	142	52		11	123	60		2	116	59
	20	139	56		12	125	62		3	113	57

Dr. Gill has derived, from the heliometer observations, another system of corrections, which is compared with the meridian observations in the last column of the above table of means for groups. It appears that Dr. Gill's corrections to Eph. B do not represent the meridian observations. Perhaps they are referred to another zero point, as by shifting Dr. Gill's curves by $+ 0^s{\cdot}014$ and $- 0''{\cdot}21$ respectively a satisfactory agreement would be obtained for the period covered by the heliometer observations; but this period was too short to allow of a sufficiently accurate determination of the higher terms, and it is safer therefore to use the variations shown by the graphical interpolation between the meridian observations, which consequently is done in the following determination of parallax.

There are altogether 34 days with observations from southern observatories between September 10 and October 30, and on all of these days except two the planet

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was also observed in the northern hemisphere. Instead of deriving, however, the 32 day results for parallax, it was preferred at once to form 13 groups from the observations September 9—November 1, so as to include 14 more days with observations from the northern hemisphere, only those made September 14, 22, 29, October 16, or five observations altogether within that interval not being used.

Determination of Parallax.

Group	Obs. from N. Hem.			Obs. from S. Hem.			Red. to N. Ep.	Diff. $\Delta\delta$	p	Parallax			Fact. $\Delta\pi$	$\Delta\pi$	Wt.
	Ep.	$\Delta\delta$	p	Ep.	$\Delta\delta$	p		S.—N.		N.	S.	Sum			
		″			″		″	″		″	″	″		″	
Sept. 9 to 11	10·55	—0·366	0·90	11·02	+0·165	0·72	0·000	+0·531	0·400	5·22	7·45	12·67	1·440	+0·369	0·83
„ 15 „ 18	17·67	—0·756	2·32	17·81	—1·147	0·61	+0·003	—0·388	0·483	5·72	7·78	13·50	1·534	—0·253	1·14
„ 19 „ 21	20·57	—0·409	0·97	19·78	—0·287	1·02	—0·024	+0·098	0·497	4·93	7·92	12·85	1·460	+0·067	1·06
„ 23 „ 25	24·41	—0·340	2·00	24·48	—1·497	1·07	+0·001	—1·126	0·697	6·05	7·68	13·73	1·561	—0·741	1·70
„ 26 „ 28	28·01	—0·134	0·83	27·60	—0·936	1·35	0·000	—0·802	0·514	5·88	7·77	13·65	1·551	—0·516	1·24
S. 30 to O. 2	1·21	—0·426	1·28	1·50	—0·839	1·62	—0·009	—0·422	0·715	6·03	7·80	13·83	1·571	—0·268	1·77
Oct. 3 to 4	3·95	—0·733	2·85	3·68	—0·427	0·63	+0·008	+0·314	0·516	6·35	7·79	14·14	1·605	+0·196	1·33
„ 5 „ 7	6·39	—0·168	1·70	5·90	—0·450	1·14	+0·004	—0·278	0·682	6·44	7·73	14·17	1·611	—0·173	1·77
„ 8 „ 11	9·49	—0·397	1·82	9·93	—0·245	0·72	+0·013	+0·165	0·516	6·25	7·44	13·69	1·544	+0·107	1·23
„ 12 „ 15	14·06	—0·702	4·57	14·09	—0·834	1·30	0·000	—0·132	1·060	6·49	7·36	13·85	1·574	—0·084	2·63
„ 17 „ 21	19·31	—0·637	0·72	18·90	—1·010	0·72	—0·004	—0·377	0·360	5·97	7·04	13·01	1·478	—0·255	0·79
„ 22 „ 26	24·94	—0·328	2·09	24·05	—0·820	1·08	0·000	—0·492	0·712	6·50	6·76	13·26	1·507	—0·327	1·62
Oct. 27 „N.1	30·18	—0·696	3·37	29·86	—0·760	0·72	+0·003	—0·061	0·593	6·39	6·42	12·81	1·455	—0·042	1·26
													Mean	—0·174	

Hence is

$$\pi = 8''\cdot626$$

with weight 18·37. The agreement of the 13 determinations of $\Delta\pi$ is not quite so near as was expected, as the differences from the mean give $\Sigma pvv = 1\cdot3837$, or the square of m. e. for weight $1 = 0\cdot1152$ instead of the supposed quantity 0·1, making the m. e. for weight $1 = \pm 0''\cdot340$, or the apparent mean error of the result derived for $\pi = \pm 0''\cdot079$.

The result however differs from the true value of π by about double its apparent m. e. This error is not produced by chance grouping of the purely accidental errors of the single observations, but indicates that notwithstanding the differential treatment some systematic difference has remained in this case uneliminated in the comparisons.

The nature of the systematic difference and its bearing upon the determination of parallax at once becomes manifest by a glance on the columns v', showing the apparent outstanding errors for the separate series of observations. The values v' are the

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true errors—referred to some mean system between the different observers—of the separate reduced observations very approximately, and from the general distinct prevalence of the same sign in some of the series it is clear that these errors contain some constant deviation in those cases. It is very probable that the uncertainty of the magnitude equations has produced these deviations; as *Sappho* was fainter than all of the comparison stars, and considerably below the mean magnitude of these, this uncertainty, as to quantity of the co-efficients and form of the expression, can produce, and in this case has produced, a noticeable effect upon the planet's places.

Taking the means from the separate series of v', without regard to the generally slight differences of weight within the single series, the mean deviation from the assumed correction of the ephemeris, retaining $\pi = 8''\cdot8$, is found, for

	s	″	
Berlin	—0·025	—0·14	from 15 obs. (excluding Oct. 27, when the planet was barely visible)
Cambridge	+0·064	+0·31	„ 16 „
Cape, Macl.	—0·027	+0·12	„ 15 „
„ Pett	+0·034	—0·44	„ 13 „
Leipzig	+0·019	—0·13	„ 17 „
Pulkowa		+0·52	„ 16 „

Subtracting these quantities from the errors v', the errors remain which in the comparison of the observations are given under the heading v''. In the other series the mean deviation remains within the limits of accidental error.

The apparent error of R.A. is negative in all of the Berlin observations, except one, which makes it zero, while it is positive in 13 of the 16 Cambridge observations. From the v'' the probable error of these means is found $\pm 0^s\cdot003$ for Berlin, and $\pm 0^s\cdot012$ for Cambridge, so that there is no doubt that the Cambridge Right Ascensions of *Sappho* reduced by the stars remain approximately $0^s\cdot09$ bigger than the Berlin Right Ascensions. The deviation is not so decidedly marked in the three other series of Right Ascensions, the computed p. e. for the three following means being $\pm 0^s\cdot011$, $\pm 0^s\cdot014$, $\pm 0^s\cdot008$, but also in these cases the deviation in R.A. appears real. Probably the Berlin system is very near to the truth, and the Cambridge and the Leipzig observer, and at the Cape Mr. Pett, were late in registering the transit of the faint planet considerably more than was assumed in the reductions, approximately by $0^s\cdot09$, $0^s\cdot04$, $0^s\cdot06$ respectively. It is not doubtful that part at least of the fault lies with the assumed linear form of the magnitude equation; it had to be expected beforehand that the reduced Cambridge R.A. for example still would show a retardation, as the assumed co-efficient had the very considerable value $-0^s\cdot026$, and it was quite probable that its increase, which generally takes place with diminishing brightness, would become noticeable in extrapolating from the magnitude of the comparison stars to that of *Sappho*. Only the amount of observed retardation far exceeds what could be expected; this excess could be somewhat, but scarcely appreciably, diminished by assuming the planet really to have been fainter than it was estimated.

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In the Declinations, the differences are not quite as large, and some of the six mean values given above might be explained by accidental error, the probable error computed from the v'' becoming $\pm 0''\cdot06$, $\pm 0''\cdot11$, $\pm 0''\cdot09$, $\pm 0''\cdot09$, $\pm 0''\cdot07$, and $\pm 0''\cdot17$ respectively. But still the same sign of the deviation is found in two-thirds or three-fourths of the Berlin, Cambridge, Leipzig, and Pulkowa series, while of Mr. Pett's 13 observations 11 agree to place the planet more to the south by about half a second, and 2 only give a trifling northern deviation. It is chiefly Pett's series—besides, next to this, and to an appreciable extent, the Pulkowa series—that makes the parallax so small, while the mean of Maclear's and of the Melbourne observations (mean deviation $-0''\cdot10$ for 12 obs.) very closely would agree with the mean of the northern observations adopting $8''\cdot8$ for π. It is to be remembered that a difference $\Delta\delta$ (Pett – Maclear) varying with magnitude at the rate $-0''\cdot19$ has been allowed for in the reduction of the Cape observations, diminishing Maclear's Declinations for *Sappho* on the average by $0''\cdot13$ and increasing Pett's by the same quantity.

The difference here shown in the planet's Declinations between the two Cape observers, P. – M. $= -0''\cdot56 \pm 0''\cdot13$, would have been even $-0''\cdot82$ without this reduction. On the contrary, of the difference between the same two observers' Right Ascensions here shown $= +0^s\cdot06$, more than one-half $(+0^s\cdot036)$ is due to the assumption, made in the reductions, that Pett went fast of Maclear in observing fainter stars at the rate of $0^s\cdot027$ for one magnitude; this amount found from the comparison stars apparently does not hold good much below $8^m\cdot0$, or at least was much overrated. In the Pulkowa Declinations here appearing $0''\cdot5$ too north, the difference, too, has been increased (by $0''\cdot12$ however only) by application of the reduction $+ 0''\cdot09$ (M – 8), which the stars seemed to require, but which apparently is wrong.

Nothing, however, can be changed in the preceding determination of parallax, as any change afterwards introduced in the treatment of the observations, carried out as strictly differential as possible before, would be quite arbitrary and merely lead to a false estimate of the accuracy attained. The systematic differences remaining in the reduced Declinations of different observers because of the difference of magnitude of planet and stars must be allowed for as additional accidental errors, and while they cannot by any means be eliminated from the determination of parallax, they increase, in the case of this faint planet to a considerable extent, the uncertainty of the final result beyond the limits of m. e. assigned to it by the *inter se* agreement of the results from the separate days or groups, which agreement itself already was lessened to some plainly noticeable extent from the very same reason.

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Assuming the constant error, to which one observer's relative Declinations have been liable in the case of *Sappho*, $\pm 0''\cdot 2$, which probably is a fair estimate, the mean of the northern observations would remain liable to systematic m. e. of about $\pm 0''\cdot 08$, and the mean southern result, depending upon the observations of Maclear, Pett, and the three Melbourne observers together, in the proportion of about 8 : 7 : 4, to about $\pm 0''\cdot 11$, making the additional m. e. of the comparison $\pm 0''\cdot 14$ or of π: $\pm 0''\cdot 092$. This additional error however is not to be combined with the value $\pm 0''\cdot 079$—already increased a little by the same systematic error—of the accidental error found above, but with $\pm 0''\cdot 074$ from m. e. $= \sqrt{0\cdot 1}$ and sum of weights. Thus the total m. e. of π from the *Sappho* observations is found to be: $\pm 0''\cdot 118$, or the probable error $\pm 0''\cdot 080$.

Combining the three results, viz.:

from *Iris*	$\pi = 8''\cdot 771$	m. e. $\pm 0''\cdot 130$
„ *Victoria*	$8\cdot 845$	$\pm 0\cdot 051$
„ *Sappho*	$8\cdot 626$	$\pm 0\cdot 118$

with weights according to their mean errors, the parallax from all the meridian observations becomes:

$$\pi = 8''\cdot 806, \qquad \text{m. e. } \pm 0''\cdot 044, \qquad \text{prob. err. } \pm 0''\cdot 030.$$

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DETERMINATION OF THE SOLAR PARALLAX, &c.

VOL. I., PART 6.

COMBINATION OF RESULTS

AND

GENERAL CONCLUSIONS,

BY

DAVID GILL.

A 13424. SOLAR PARALLAX, &c.

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VOL. I.—PART 6.

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COMBINATION OF RESULTS AND GENERAL DISCUSSION.

Collecting the definitive results from the preceding investigations of the value of the Mean Solar Parallax, we have—

	π_0	Probable Error.	Combining Weight.
From *Victoria*, Vol. I., Part 2, p. 532	8″·8013	± 0″·0061	2·69
„ *Sappho* „ „ 3, „ 83	·7981	± ·0114	0·77
„ *Iris* „ „ 4, „ 168	·8120	± ·0090	1·23

The combining weights are the reciprocals of the squares of the probable errors (unity = ± 0″·01). Having regard to these weights, we have, in the mean

$$\pi_0 = 8''\cdot8036 \text{ with weight } 4\cdot69,$$

and the probable error ± 0″·0046

which is the definitive value of the Solar Parallax as derived from the heliometer observations of *Victoria*, *Sappho*, and *Iris* under discussion, provided that there are no systematic errors peculiar to any of the series which have not yet been discussed. The values of the Solar Parallax derived from the separate groups in the case of *Iris* are given by Dr. Elkin, Vol. I., Part 4, pp. (152) and (165). For *Victoria* and *Sappho* they are as follows :—

VICTORIA. From the values of z, page 527. Solution A corrected for a and p only.			SAPPHO. From the value of z, Part 3, p. 80. Including corrections for personal error.		
Group.	π_0	Weight.	Group.	π_0	Weight.
I.	8″·741	1·2	I.	8″·777	20·4
II.	·765	19·7	II	·792	27·2
III.	·808	27·3	III.	·790	25·6
IV.	·842	47·5	V.	·830	17·8
V.	·772	12·8	VI.	·837	19·5
VI.	·842	27·5	VII.	·777	24·4
VII.	·780	39·7			
VIII.	·838	38·8	Group IV. is omitted for the reasons given at page 79.		
IX.	·729	24·0			
X.	·828	20·3			
XI.	·788	73·9			
XII.	·793	41·3			
XIII.	·823	49·7			
XIV.	·801	36·1			
XV.	·722	16·5			

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The system of weights corresponds approximately to a *mean error* of $\pm 0''\cdot 20$ for weight *unity*.

The history of astronomy presents no combination of results of like *apparent* weight for the independent determination of the Solar Parallax by trigonometrical methods.

It is unnecessary to confirm this statement farther than to refer the reader to Professor Harkness' work on "the Solar Parallax and its related constants," where at pages 51–54 will be found a list of the various values of the Solar Parallax which have been derived by different astronomers from observations of Transits of Venus and Oppositions of Mars, &c.

The value of the Solar Parallax found by Dr. Auwers from his discussion of the meridian observations (Part 5, p. [95]), viz. :—

$$8''\cdot 806 \text{ with the probable error } \pm\ 0''\cdot 030$$

is almost identical with that derived from the heliometer observations, but it is affected with so large a probable error that its weight is less than $\frac{1}{40}$th part of that of the latter, and its exclusion or inclusion does not sensibly affect the mean result already arrived at.

It is only fair to the meridian observers, and to the meridian method generally, to state that the derivation of the Solar Parallax from meridian observations formed no part of the original programme, and that these observations of the planets were requested solely for the purpose of affording preliminary corrections to their tabular motions. Had the primary object been to determine the parallax from observed Declinations, there is no doubt that more pointings could have been taken at each transit, and a higher accuracy attained.

The immense importance of the meridian observations really lies in the splendid material which they furnished towards a rigorous determination of the places of the comparison stars and by the control which they exercised against any tendency to cumulative error in the heliometer triangulation; indeed it would have been impossible without their aid to discuss the various actual and possible sources of systematic error with satisfactory completeness.

The important question now to be discussed is, whether our weights are *real* as well as *apparent*, whether, in fact, these accordant values of the Solar Parallax, furnished by our heliometer observations of the minor planets, can be suspected of any systematic error. Such a discussion naturally divides itself into two parts :—

(1) The sources of systematic error which, on any possible and reasonable assumption, may be inherent to the adopted method of observation or reduction.

(2) Their accord or disaccord with other independently determined constants of astronomy.

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Possible Sources of Inherent Systematic Error.

So far as I am able to foresee, there are only two possible outstanding sources of systematic error which have not been already exhaustively discussed—

(*a*) Error in the adopted tabular values of the planet's distance from the Earth, expressed in terms of the Earth's mean distance from the Sun.

(*b*) Error produced by systematic difference of refrangibility between the mean visual light of the minor planet and that of the comparison stars.

(*a*) Dr. Elkin has already, Part 4, p. (20), discussed the first of these questions for *Iris*. He finds that there is a small systematic difference between the values of Δ derived from his special opposition-ephemeris, and those given by Brünnow's Tables of the Planet; as the latter have represented the observed motions of *Iris* very closely, there can be no doubt that they are correct, at least, far within the limits required for our purpose; a small correction of $-0''\cdot003$ has been applied by Dr. Elkin to the computed parallax to reduce his result to what it would have been if Brünnow's values of Δ had been employed.

From the appendices by Herr Lange and Lieut. Von der Pröben, attached to the present section of the work, it will be seen that the elements, employed for the computation of Δ, represent the observations of *Victoria* and *Sappho* for so many successive oppositions that no question can be entertained as to the accuracy of the values of Δ employed in the computation of the tabular parallax.

(*b*) In the memoirs of the R.A.S., Vol. XLVI., page 161, I have pointed out that—

"If the light of *Mars* is of different mean refrangibility from that of a star, then a systematic error would be created which could not be satisfactorily distinguished from parallax by any possible method of observation or reduction, because, at the altitudes where it is possible to make good observations, the law of the variation of refraction does not sufficiently differ from the law of variation of parallax. If it is really the case that a difference of refraction does exist for the light of *Mars* as a whole and the light of an average star, it is probable, from its redder hue, that the light of *Mars* would be less refracted than the light of an ordinary star, and, if this is the case, the parallax at which I have arrived will have to be diminished."

Subsequently, Newcomb, in his "Constants of Astronomy," page 165, writes—

"If the difference between the spectra of a minor planet and a comparison star is such that the means of their respective visible spectra, or the apparent amounts of their respective refractions, differ by one-tenth of the space between D and E, an error of $0''\cdot02$ or $0''\cdot03$ may be produced in the apparent parallax of the planet."

In the case of *Victoria* and *Sappho* I can confidently state that it is quite impossible to distinguish between the image of the planet and that of the average fixed star of similar magnitude, when both are juxtaposed in the field of the heliometer.

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I believe also that a mean visual difference of colour much less than one-tenth of that between D and E would be readily distinguishable under such a test.

In the case of *Iris*, Dr. Elkin remarked a tendency to a less refrangible colour than that of the average fixed star, and, when he subsequently mentioned the matter, my *recollection* of its appearance went to confirm his remark, but my original notes contain no mention of the subject. The larger value of π_0, derived from the *Iris*-series, would favour Elkin's remark that the average light of *Iris* is rather less refrangible than that of the average fixed star; but, as this difference from the mean value of π_0 is rather smaller than the probable error of the determination of π_0 from the *Iris* series alone, but little weight can be attached to such a conclusion.

A more legitimate conclusion would be, that, if a less refrangible colour is *distinctly perceptible* in the case of *Iris*, and such perceptible colour produces so small an effect on the derived parallax, then, when *no perceptible* difference of colour from that of an average star can be detected (as it certainly cannot in the case of *Victoria* and *Sappho*) the influence of colour on the resulting parallax will also be insensible.

On the more general question of the reliability of the results, based on the internal evidence of the researches themselves, a few words may be added. In a series of papers published in Vol. I. of "*The Observatory*," I arrived, *inter alia*, at the following conclusions :—

No method can be admitted (for determining the Solar Parallax) which is liable to systematic error; and every method which is not "self-correcting" is liable to such error; that is to say, *the observations themselves must afford the material for the determination and elimination of all the errors to which the method can be shewn to be liable.*

So far as I am aware, no one has disputed these conclusions, and subsequent experience confirms my original opinion.

If we apply this test to the preceding researches, we find the following facts :—

The effect of error in the adopted instantaneous scale-value (Vol. I., pp. 9 and 10) has no influence on the results, from the fact that, in the observations of double distances, the correction of the adopted scale-value is introduced as an unknown quantity, and absolutely eliminated (*see* page 393) ; so that, whatever scale-value was originally adopted, the result will be precisely the same. In double position-angles the effect of instantaneous index-error is similarly eliminated. In single distances and position-angles the scale-value and index-error are strongly determined by observations of the standard stars.

The observations are affected by considerable personal errors, some of which are a function of the distance, and others a function of $\frac{ds}{dt}$ or $\frac{dp}{dt}$. Those of the former class

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are strongly determined, and those depending on $\frac{ds}{dt}$ for Dr. Peters' observations are also determined with considerable certainty. In the case of *Victoria* these errors have been carried throughout the computations in symbolic form, so that the final value of z ($=0{\cdot}88\delta\pi_0$) is given (page 526) in terms of these symbolic quantities.

So "self-correcting" is the method, that the co-efficients of these personal errors come out exceedingly small in the expression for z, and, when the actual values of these independently determined terms are substituted, they hardly influence the result. A full statement of the values of z after every variety of neglect or substitution of these terms will be found at pages 526–533.

At pages 532 and 533 it is also shown that the Cape observations alone of *Victoria* give, by the diurnal method—

$$\pi_0 = 8''{\cdot}8014 \pm 0''{\cdot}0108,$$

whilst for the same planet all the observations of all the co-operating observatories combined give—

$$\pi_0 = 8''{\cdot}8013 \pm 0''{\cdot}0061.$$

This, alone, may be regarded as a strong proof of the freedom of the method from systematic error—for it leaves, so far as I can see, no admissible sources of systematic error, except possible inaccuracy of the adopted tabular distances (expressed in terms of the Earth's mean distance from the Sun) and a possible difference between the refrangibility of the mean visual light of the planet and that of the comparison stars. Both these latter questions have been already disposed of.

In the case of the *Sappho* series it is impossible to derive the parallax by the diurnal method as an accurate independent check for the reasons given in Part 3, p. 80.

Instead of the check by the diurnal parallax, the value of the parallax has been derived from a separate combination of the observations made at each northern observatory with the corresponding observations made at the Cape.

The results are :—

	I. Neglecting personal corrections.			II. Including personal corrections.		
	π_0	Probable Error.	No. of Determinations.	π_0	Probable Error.	No. of Determinations.
	"	"		"	"	
Cape and Yale	8·806	±0·020	16	8·797	±0·020	16
Cape and Leipzig	·761	± ·029	11	·793	± ·026	11
Cape and Göttingen	·840	± ·032	7	·834	± ·031	7
Cape and Bamberg	·731	± ·056	1	·725	± ·056	1

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The above probable errors are derived from the agreement of the different results *inter se* in each separate series, having regard to their several weights as assigned in the original discussion, except in the Cape-Bamberg combination, where there is only one determination, and the probable error is computed from the weight of the combination for z (5·72·), on the assumption that the *mean error* for weight unity is $\pm$ 0″·20.

These results furnish a striking proof of the probable freedom of the *Sappho* result from systematic error, since the values of π_0 from the separate series agree better with each other than one would expect from their probable errors.

For the *Iris*-series Elkin has similarly computed the value of π_0 both with and without the corrections for personal error G, E, &c.—(employing the values of those terms which were determined from the *Victoria* series)—and finds no sensible difference in the mean value of π_0, whether these corrections are employed or not, except that the probable error is slightly diminished by their introduction. He has also shown conclusively that the results are independent of small errors in the ephemeris. Elkin has not taken into account the personal terms depending on $\frac{ds}{dt}$, because, at the time when he made the computations I had not detected the existence of such a term in the *Victoria* series. I have since examined the approximate effect of this omission, and find that it will be without the smallest sensible influence on the parallax derived from *Iris*; 1st, because the direction of motion of the planet is nearly at right angles to the direction of the line of measurement, and, consequently, $\frac{ds}{dt}$ is very small; and, 2nd, because, in nearly every group of observations $\frac{ds}{dt}$ (as defined at pages 461–463) is negative in the first half of the group and positive in the second half—so that the effect on the resulting parallax is quite insensible.

But the most conclusive evidence of the general reliability of the results in all the three investigations is to be found in the satisfactory accord throughout the whole work between the probable errors of the values of π_0 when computed, on the one hand, by weights founded on the agreement of separate pointings, and, on the other hand, when derived from the agreement of the separate determinations of π_0.

This is, in fact, a crucial test, upon the application of which, in some analogous form, most researches in practical astronomy reveal the existence of large unknown sources of systematic error.

Thus, for example, in the discussion of the corrections applicable to the Greenwich and Cape meridian observations (*Cape General Catalogue for* 1885, page xliii) it is absolutely impossible to represent the observations of the various groups of stars of different declinations as observed at both observatories, or at upper and lower transit

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at either observatory, within limits of their apparent probable errors, on any reasonable general hypothesis. From the residuals in the discussion, the probable error of an observation of weight *unity* is found to be $\pm 1''\cdot5$; whilst, from the agreement of the results composing separate groups, the computed probable error corresponding to weight unity was $0''\cdot50$. In other words, the *true* weights have only *one-ninth part* the weight of the *apparent* weights, that is, of the weight which the results should have if they were not affected by large systematic errors.

In a greater or less degree similar discrepancies between the original and true final weights are to be found in a large number of similar researches, and their comparative or complete absence in the present instance is, to my mind, one of the most convincing internal proofs of the freedom of the final results from systematic error.

We have, lastly, the agreement of the values of π_0 derived from the independent observations of three different planets; in every case the value of π_0 differs less than its probable error from the mean.

But for the suspicion that the refrangibility of the mean visual light of *Iris* may be slightly less than that of the average comparison star, there could be no hesitation in adopting as final:

$$\pi_0 = 8''\cdot8036 \text{ probable error } \pm 0''\cdot0046$$

as already derived.

But if this result is really systematically affected by the colour of *Iris* (although, as far as the evidence of the different values of π_0 go, it is almost exactly an even chance that they are not so affected) we should have to reject the *Iris* observations as subject to sensible systematic error and adopt the weighted mean of the results from *Victoria* and *Sappho* only, viz.:—

$$\pi_0 = 8''\cdot8006 \text{ probable error } \pm 0''\cdot0054.$$

On the whole the safest course appears to be to adopt the mean of these two results, viz.:—

$$\pi_0 = 8''\cdot802$$

with the probable error $\pm 0''\cdot005$

as the final result of this discussion, and one that may be regarded as absolutely reliable within such limits as are indicated by the value of its probable error.

The Mass of the Moon.

Before proceeding to compare our results for the value of π_0 with other astronomical data, it is desirable to derive the definitive value of the mass of the Moon from the observations of *Victoria* and the definitive value of π_0.*

* The reader is requested to correct a typographical error on page 536 which, by some mischance, was introduced after the sheets were passed for press, viz.:—

for $\kappa = \kappa_0 (1\frac{1}{10} + \mu')$ *read* $\kappa = \kappa_0 (1 + \frac{1}{10} \mu')$.

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From the discussion of the observations of *Victoria*, I derived (page 537)

$$M = 1 \div (81{\cdot}693 \pm 0{\cdot}082 + 9{\cdot}40\ \Delta\ \pi_0)$$

where M is the mass of the Moon, that of the Earth being *unity*, and where the true value of the mean solar parallax was assumed to be

$$\pi_0 = 8''{\cdot}800 + \Delta\ \pi_0$$

As we have found $\pi_0 = 8''{\cdot}802 \pm 0''{\cdot}005$ (page 9), we have for the true value of the Moon's mass

$$\mathbf{M} = \frac{1}{81{\cdot}702 \pm 0{\cdot}094}$$
$$= 0{\cdot}012240 \pm 0{\cdot}000015$$

These probable errors include the effect of the probable error of the determination both of μ' and π_0.

The determination of μ' is practically free from the effect of any difference between the refrangibility of the light of *Victoria* and that of the comparison stars, and it is shown (page 538) that it is also practically independent of the effect of any systematic error that might be introduced by use of the empiric corrections employed in the correction of the ephemeris. The most searching examination has failed to suggest any source of systematic error to which the result is liable.

Comparison of the Heliometer Results with other Astronomical Data.

The Constant of Nutation.

Newcomb in his *Constants of Astronomy*, page 132, derives from Oppolzer's developments of the relations between the constants of Precession and Nutation the following expressions, which are completely confirmed by Hill's independent work. (*Astronomical Journal*, Vol. XIII., No. 289.)

$$\left.\begin{aligned} N &= [5{\cdot}36542]\ .\ \frac{M}{1+M}\cdot\frac{C-A}{C} \\ P' &= [5{\cdot}937585]\ .\ \frac{M}{1+M}\cdot\frac{C-A}{C} \\ P'' &= [3{\cdot}68762]\ .\ \frac{C-A}{C} \end{aligned}\right\}\text{For the equinox 1850.}$$

where N is the constant of Nutation of the obliquity of the Ecliptic, as defined by the equation $\Delta\ \epsilon = N \cos \Omega$, and expressed in seconds of arc.

P′, so much of the Precession of the Equinox on the fixed ecliptic of the date, in seconds of arc in a Julian year, as is due to the action of the Moon.

P″, so much of the same precession as is due to the action of the Sun.

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M, the ratio of the mass of the Moon to that of the Earth.

A, the mean moment of inertia of the Earth relative to axes passing through its Equator.

C, the same moment relative to its polar axis.

We may also put

$$p_0 = P' + P'' = \text{the Luni-Solar Precession.}$$

Newcomb remarks (*loc. cit.*, page 131) that "the numerical co-efficients in the above equations may be regarded as absolute constants, so accurately determined that no question of their errors need now be considered." The observed value of the Luni-Solar Precession is known with greater certainty than that of any of the other astronomical constants under present consideration.

Newcomb (*loc. cit.*, page 133) adopts

$$p_0 = 50''\cdot360 \pm 0''\cdot006,$$

but in the *Astronomical Journal*, No. 359, Newcomb revises this value, partly for a reason which, so far as I know, was first pointed out by me (*Mem.* R.A.S., Vol. XLVI., page 82), viz., personality depending on magnitude in observing transits of stars, on account of which, especially in the chronographic method of observing, the instants of transit of bright stars are recorded too early relative to faint stars. These facts are much more clearly brought out in Auwers' discussion of the meridian observations of the *Iris*, *Victoria* and *Sappho* comparison stars contained in Vol. II. of the present work, and controlled and slightly modified by the Heliometer Triangulation, page 143, Vol. I.

For our immediate purpose it is unnecessary to discuss the precise value which should be ultimately adopted. I adopt as amply approximate—

$$p_0 = 50''\cdot367 \text{ with the } \textit{probable error} \pm 0''\cdot004$$

Substituting in the preceding equations, which express the relations between p_0, M and N, the above values of p_0 and M, we get—

$$N = 9''\cdot2068 - 0\cdot0353\,\delta\mu_1 + 0\cdot182\,\delta p_0$$

$$\frac{C - A}{C} = 0\cdot0032825 + 0\cdot0000270\,\delta\mu_1 + 0\cdot000065\,\delta p_0$$

where μ_1 is the reciprocal of the Moon's mass.

Whence with the probable errors of μ_1 and p_0

$$N = \mathbf{9''\cdot2068} \quad \text{with the probable error} \pm \mathbf{0''\cdot0034}$$

$$\frac{C - A}{C} = \mathbf{0\cdot0032825} \quad \text{,,} \quad \text{,,} \quad \pm \mathbf{0\cdot0000025}$$

The two existing discussions of the most probable value of the constant of Nutation

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which are based on the broadest grounds of direct observation, and are most likely to be accepted by astronomers generally, are

	N.	Prob. error.
(1) Newcomb's (*Constants of Astronomy*, page 130)	9″·210	± 0·006
(2) Chandler's (*Astronomical Journal*, No. 361)	9″·202	

The mean of these results is practically identical with that derived from the heliometer observations, and affords a striking confirmation of their probable freedom from systematic error. This conclusion is the more satisfactory from the fact that, of all the constants of astronomy under present consideration, the Luni-Solar Precession and the Nutation have been determined by direct observation with the greatest freedom from systematic error and the smallest probable error.

The Parallactic Inequality of the Moon.

This apparently powerful method of determining the Solar Parallax depends upon the theoretical relation which subsists between the mean Solar Parallax and the constant of the Parallatic Inequality.

According to Newcomb, *Astronomical Papers*, Vol. I., this theoretical relation is expressed by the equation—

$$I = [1{\cdot}16242]\,\frac{1-M}{1+M}\cdot\,\pi_0$$

where I is the constant of the Parallatic Inequality,

M is the ratio of the mass of the Moon to that of the earth, and

π_0 is the value of the mean Solar Parallax.

Subsequently, however, in the *Astronomical Journal*, No. 356, page 167, Newcomb publishes a note "On the Solar Parallax as derived from the observed Parallatic Inequality of the Moon," in which he calls attention to remaining uncertainties as to the true theoretical relation between the value of π_0 and that of the Lunar Parallactic Inequality. The note runs as follows :—

"In deriving the Solar Parallax from the parallatic inequality, we necessarily assume the relation between these quantities to be accurately given by theory. In my work on this subject I have used the relation as determined by the aid of Hansen's numerical theory. The comparison of this theory with that of Delaunay, given in the first volume of the Astronomical Papers of the American Ephemeris, tends to inspire confidence in the precision of his results, because, where the co-efficients were well determined from Delaunay's theory, the agreement was very generally satisfactory; and where Delaunay's terms were not well determined, owing to the defective convergence of the series, the difference was generally quite compatible with the probable value of the terms omitted by Delaunay. In the case of the parallatic inequality, however, the agreement could be brought about only by assuming either a somewhat improbable irregularity in the progression of the higher terms omitted by Delaunay, or an error in the highest term which he computed. As the doubtful term in question was incompatible with the seeming law of the series as derived inductively from the preceding terms, while this law, if accepted throughout, would

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reproduce Hansen's result, I accepted the latter with entire confidence in its correctness. Now, however, the results published by Mr. G. W. Hill in No. 353 of the *Astronomical Journal*, taken in connection with the previous results of Professor Brown, given in the *American Journal of Mathematics*, Vol. XIV., confirm Delaunay's theory, so far as the principal doubtful term is concerned. Accepting this confirmation, and deriving the values of those terms which depend on the Eccentricity and Inclination by Delaunay's theory, as conjecturally completed through induction, the result will be an increase of the Hansenian theoretical value corresponding to a given value of the Solar Parallax by 0″·30. Conversely, the value of the Solar Parallax, derivable from the observed value of the parallactic inequality, should be diminished by 0″·021. I have found for the value in question 8″·794. If, then, we accept the conclusions here reached, we shall have—

Solar parallax from the parallactic inequality =8″·773.

We cannot, however, regard this correction as conclusive, because there is still some doubt as to the theoretical magnitude of the terms in e^2 and γ^2, owing to the incompleteness of Delaunay's theory. The uncertainty would, however, be less than 0″·10 in each term, and therefore less than 0″·01 in the Solar Parallax, were it not that the case of the principal term shows that the process of completing the series of the lunar theory by induction is always a doubtful one. The determination of the quantities depending on the lunar eccentricity and inclination by the new methods of Hill and Brown are, therefore, much to be desired."

It is evident from this that no definitive conclusions can be arrived at as to the value of the Solar Parallax from the observed value of the parallactic inequality until the theoretical difficulties of the matter have first been settled.

But difficult as these theoretical uncertainties are to unravel, they are certainly not less than the uncertainties which beset the practical determination of the constant itself, from the fact that when the co-efficient of the inequality has opposite signs, the observations have to be made on opposite limbs of the Moon. The employment of the method, with its full weight, therefore requires an exact determination of the Moon's diameter. Unfortunately, the diameter of the Moon, as observed by different observers, or by the same observer under different conditions of illumination, is very different. The meridian determinations of diameter are necessarily made only at transit when the Moon is full, and when the contrast between the illumination of the Moon and sky is greatest, and the co-efficient of I is zero. The observations when the co-efficient of I is large have to be made when the Moon is seen projected on a strongly illuminated sky. At full Moon the absolute illumination of the limb is less intense than it is near quadrature, and, as Newcomb points out, some portions of the limb may, near full Moon, be thrown into shadow by a horizontal Sun, whilst they might be visible at quadrature when illuminated by a nearly vertical Sun.

Newcomb (*Astronomical Constants*, page 148) has endeavoured to avoid these difficulties by determining the inequality from each limb separately, and assuming, besides, that the difference between the tabular and observed semidiameter may be regarded, for each observatory, as a function of the atmospheric illumination of the sky.

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Such an assumption, even if it could be satisfactorily expressed in form for computation, fails to take into account the large personal difference in the semidiameters obtained at the same observatory with the same instrument by different observers, and by the same observers with the same instrument under different conditions of atmospheric definition.

There remain also the imperfections of Hansen's tables (they no longer accurately represent the observations), which may further combine to produce systematic error in the apparent value of I. Having regard to all these drawbacks, and the further fact that the geometrical weight of the method is reduced to one-fourth of what it would be were it possible to employ factors of I having opposite signs, it is surprising that a result of such *apparent* accuracy should be arrived at as that which Newcomb has found.

But until the details of his investigation are published it is impossible to subject it to closer criticism.

Newcomb deduces from the Greenwich and Washington meridian observations of the Moon made since 1882

$$\pi_0 = 8''\cdot802 \pm 0''\cdot008,$$

a result which is in perfect agreement with the heliometer observations, but which cannot be regarded as having, in any degree, the confirmatory weight which is afforded by the Nutation Constant—because its accuracy as indicated by the above mean error is, for above-stated reasons, more *apparent* than *real*.

Franz (*Astronomische Nachrichten*, Vol. 136, No. 3262) has endeavoured to evade the difficulty by observing meridian transits of the Lunar Crater Mösting A. The observations, from 1891 December 16 to 1893 January 7, were made with the 4-inch Meridian Circle at Königsberg, and comparison stars of nearly the same declination as the Moon were employed. He finds that the *mean error* of an observation in longitude is $\pm 1''\cdot677$, and of latitude $\pm 1''\cdot051$, or, in fact, that one observation of the Crater has three times the weight of a Greenwich meridian observation of the Moon or seven times that of an altazimuth observation.

What is far more important, however, is the careful investigation of the effect of phase on the apparent position of the Crater, an effect which heliometer observations appear to show has a range limited to about $\pm 0''\cdot3$, and follows a well determined law.

No investigation of a periodic error of the lunar tables is made, beyond the adoption of Newcomb's correction, but the residuals appear to give evidence of some

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outstanding error of the kind. The resulting value of π_0, as quoted by Newcomb (*Astronomical Constants*, page 152) is

$$\pi_0 = 8''\cdot767 \pm 0''\cdot021.$$

Dr. H. Battermann (*Beobachtungs-Ergebnisse der Königlichen Sternwarte zu Berlin*, Heft. No. 5) discusses the results of a series of 215 occultations of stars observed by him between 1882 April 28 and 1885 October 16, for the express purpose of determining the Moon's parallactic inequality.

The paper is exceedingly interesting and important, as showing what can be accomplished by a single observer intent on a worthy object, and it proves incontestably that, if greater attention were paid to the prediction and observation of suitable occultations and the nearly simultaneous meridian observation of the occulted stars, a great advance could be made in the precision with which the tabular errors of the Moon's place are at present determined.

Dr. Battermann's definitive result is

$$\pi_0 = 8''\cdot794 \pm 0''\cdot016$$

which Newcomb, by adopting a modified ratio of π : I changes (*Astron. Constants*, page 151) to

$$\pi_0 = 8''\cdot789 \pm 0''\cdot016.$$

The practical difficulty of the determination of the parallactic inequality is also complicated by some uncertainty as to the legitimacy of Newcomb's well-known correction to Hansen's tables. Indeed, Dr. Battermann, in his discussion, introduces two terms, whose co-efficients are respectively $\sin g$ and $\cos g$ (g being the Moon's mean anomaly), and finds that the periodic correction for 1885·0 should be

$$+ 2''\cdot96 \sin (g + 101^\circ\, 1')$$

instead of

$$+ 1''\cdot50 \sin (g + 69^\circ\, 6')$$

which latter is Newcomb's correction for the same epoch.

Dr. Battermann's correction appears to be well established, and shows the necessity for accepting with some reserve the results of any similar determinations of the value of π_0 until the errors of the lunar tables have received a full theoretical explanation, and the value of the numerical co-efficient in the expression for I (in terms of π_0 and M) has been definitively established.

When these theoretical difficulties have been overcome, heliometer observations of the distance and position-angle of the Crater Mösting A from well-determined stars, or a continuation of Dr. Battermann's occultation-method for a series of years, would probably lead to very accurate and interesting results.

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But until all this has been done the method of the parallactic inequality is incapable of affording a precise criterion of the accuracy or otherwise of any refined determination of the solar parallax.

The Lunar Inequality.

The method of determining the solar parallax by means of the lunar equation is open to many serious objections.

(1) The principal term of the equation is less than 6″·5, the largest available co-efficient little exceeds unity, and therefore any error in the determination of the constant has an augmented effect in the resulting solar parallax.

(2) The method of observation hitherto adopted to determine this small quantity has been that of meridian observations of the Sun—a class of observation which, since it involves not only liability to distortion of the instrument by the heat of the Sun's rays, but large personal errors peculiar to the observer and the atmospheric definition of the Sun's limb, is perhaps the least accurate of modern methods of angular measurement. It is true that, from the large number of observations available, and the tendency to compensation of systematic errors which the method inherently possesses, the results of discussions of various series quoted by Professor Newcomb (*loc. cit.*, page 141) agree in a remarkable manner, considering that there are numerous errors of 3″ and 4″ in the results of individual observations on which the results are based. But it requires an undue reliance on the doctrine of probabilities, or rather a far more ample knowledge than we possess of the possible sources of systematic error to which such large series of heterogeneous observations may be liable, to trust within ± 0″·005* to any determination of a constant, from any number of observations, however large, when many of the outstanding errors of individual observations amount to ± 3 or ± 4 seconds of arc.

(3) The derivation of the solar parallax from the lunar equation requires also an accurate knowledge of the mass of the Moon, which, in such case, must be computed from the observed values of the constants

* An error of ± 0″·005 in the determination of the nutation constant, produces, as subsequently shown, an error of ± 0″·015 in the value of the solar parallax, when the latter is determined by the method under discussion; thus, to be of any value as an independent control there should be no suspicion of systematic error in L to the extent of ± 0″·005.

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of precession and nutation. The luni-solar precession and the numerical co-efficients of the equations which express the relation between the mass of the Moon, the luni-solar precession and the constant of nutation are known with practically absolute rigour for our purpose. But it is quite otherwise with the constant of nutation; it is true that this constant is known with considerable accuracy, but an error of $+ 0''\cdot01$ in the determination of the constant of nutation changes the value of the reciprocal of the Moon's mass by 0·28, when the latter is computed from observed values of the luni-solar precession and the constant of nutation. The effect of this is to change the value of π_0, when it is computed from the observed value of the lunar equation and the mass of the Moon, by $- 0''\cdot030$.

That is to say, if δL is the error of the adopted value of the lunar equation, and δN the error of the resulting value of the constant of nutation, then the error of the resulting value of the solar parallax will be

$$\delta\pi_0 = \frac{8\cdot802}{6\cdot415}\,\delta L - 3\cdot00\,\delta N$$

This equation shows that *the independent determination of* L *and* N *is, from a geometrical point of view, a very feeble and unsuitable method for determining* π_0. If to this be added the weakness of the practical method (that of meridian transits of the Sun) by which the value of L has hitherto been determined, it is not to be wondered at that the values of the solar parallax, derived from determinations of the lunar equation, have been discordant and unsatisfactory.

On the other hand *the same equation shows that the independent accurate determination of* L *and* π_0 *is a very powerful method for determining* N.

The most convenient *Constant* of the lunar inequality of the Earth is

$$\kappa = \frac{M}{1 + M}\cdot\pi_0$$

The perturbations of the geocentric place of *Victoria* due to the revolution of the centre of the Earth around the centre of gravity of the Earth and Moon were computed for every day by means of the rigorous formulæ on pages 440 and 441. These perturbations are linear functions of κ, and these functions are computed with quantities which can be taken, with abundant accuracy for our purposes, from the *Nautical Almanac*. Thus, if we adopt a value κ_0, based on any assumed values of M_0 and π_0, we may write

$$\kappa_0 = \frac{M_0}{1 + M_0}\cdot\pi_0$$

and

$$\kappa = \kappa_0\,(1 + \mu).$$

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As the actual perturbations formed inconveniently large co-efficients, an unknown term, μ', was employed, whose co-efficient was one-tenth of the lunar perturbation.

When the equations were solved, I found (page 536)

$$\mu' = +\ 0{\cdot}0664 \qquad \textit{probable error} \pm 0{\cdot}0137$$

The assumed value of κ_0 was $[9{\cdot}02413 - 10]$

whence, since

$$\kappa = \kappa_0(1 + \tfrac{1}{10}\mu')$$

we have

$$\kappa = \mathbf{0{\cdot}10642} \qquad \textit{probable error} \pm \mathbf{0{\cdot}00014}$$

and the determination of κ is rigorously exempt from the influence of difference between the refrangibility of the mean visual light of *Victoria* and that of the comparison stars.

The expression for the effect of the perturbation of the Sun's geocentric place due to the effect of the revolution of the centre of the Earth around the centre of gravity of the Earth and Moon, may be developed in various ways.

Newcomb (*Constants of Astronomy*, page 140) has developed it in terms of the *mean* longitude of the Sun and Moon, the mean anomalies of the Sun and Moon, and the Sun's mean elongation from the Moon's ascending node.

Stone (*Monthly Notices*, April 1893, page 351) has developed it in terms of the *true* longitudes, &c.

If both developments are accurate they must lead to the same tabular corrections of the Sun's longitude for the same instant of time, provided that the two developments have been based on the same values of the Moon's mass and the same mean radii of the Earth and Moon (*i.e.*, with the same values of M, π_0 and Q).

The employment of the lunar equation thus developed, affords an easy, rough and ready, way of deriving the value of the constant of the first term of the expression from meridian observations of the Sun, when the observations are sufficiently numerous and well distributed to admit of the assumption that the effects of the smaller periodic terms will be eliminated in the mean ; it also affords an easy way of tabulating the lunar perturbation as a function of the time, but it generally sacrifices some terms which enter into the value of r' and which may be taken into account in the value of the tabular parallax of the Moon.

If the principal term of this development, however, is computed in this way its constant does not represent

$$L = \frac{M}{1 + M} \cdot \frac{\pi_0}{\text{Sin. } Q_0}$$

but

$$P_t = n_t L \qquad \text{or} \qquad P_m = n_m L$$

according as the development has been carried out in terms of the *true* or the *mean* longitude respectively.

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According to Stone's development (*loc. cit.*, page 351), if the lunar equation is developed in terms of the *true* longitude, then

$$n_t = 0{\cdot}99547$$

or, if it be developed in terms of the *mean* longitude, as has been done by Newcomb (*loc. cit.*, page 140), and by Stone (*loc. cit.*, page 352)

$$n_m = 1{\cdot}00445.$$

From the Heliometer observations we have

$$L = \frac{\kappa}{\text{Sin. } Q_o}$$

Taking

$$Q_o = 57'\ 2''{\cdot}5\,; \text{ or log. sin. } Q_o = 8{\cdot}21990$$

we have

$$L = 6''{\cdot}414 \textit{ probable error } \pm\ 0''{\cdot}009$$

whence

$$P_m = n_m L = 6''{\cdot}443 \textit{ probable error } \pm\ 0''{\cdot}009$$

whereas Newcomb derived for the same term (*loc. cit.*, page 141), from the meridian transits of the Sun at Greenwich, Paris, Königsberg, Cambridge, Dorpat, Pulkowa, and Washington, observed previous to the year 1864 :—

$$P_m = 6''{\cdot}485 \text{ with the } \textit{mean error } \pm\ 0''{\cdot}018$$

For reasons above stated, I believe this result of Newcomb's to be subject to possibility of absolute error considerably greater than that indicated by its mean error.

The Constant of Aberration and the Velocity of Light.

There exists at present no entirely satisfactory determination of the Constant of Aberration. A few years ago one would have regarded Nyrén's determination of the constant as almost beyond reproach ; but since that time two important facts have been clearly demonstrated, neither of which was considered and provided against when W. Struve planned the system of prime-vertical observations, which has been so long and successfully followed at Pulkowa.

1. Change of latitude, different from the Eulerian change.
2. Change of personal equation in observations of transits, depending on the star's apparent brightness.

It may be urged that it is still possible to correct existing observations, such as the Pulkowa prime-vertical series, for change of latitude. But it is one thing to apply to a series of observations corrections which have been subsequently derived by less

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refined processes, and another to anticipate in the arrangement of the observations the existence of certain sources of error, and to provide, *within the series itself*, for their detection and elimination. Had W. Struve anticipated the discoveries of Küstner and Chandler, he would probably have adopted more rigorous methods for the simultaneous elimination of the effect of change of latitude from the observations along with the determination of the Constants of Aberration and Nutation, and had he suspected the possibility of change of personal equation with magnitude, he probably would not have employed the prime-vertical method.

The fact that an observer's personal equation in observing transits varies with the apparent magnitude of the star also materially modifies the perfect confidence that can be placed in the ultimate precision of the otherwise exquisite Pulkowa determination.

The maxima and minima of Aberration in Declination for any star at transit occur in the evening and morning. In an early evening transit the star will appear fainter in the strong daylight at its eastern transit over the prime-vertical, than it will, an hour or two afterwards, at its western transit in a darker sky. The reverse will be the case in the morning near sunrise.

These remarks apply with increased force to Wagner's determination from transits of circumpolar stars in the meridian, because the maxima and minima of aberration in R.A. occur at noon and midnight.

Of the methods for determining the variation of latitude simultaneously with the Constant of Aberration, that which promises the best results is the well-known zenith telescope method, now so largely employed in investigating change of latitude. It is a pity that the fine series of observations, which have been carried out in the past for change of latitude only, had not been arranged also with a view to the simultaneous determination of the Aberration Constant by observation of stars symmetrically arranged in groups round the 24 hours of Right Ascension, and so that two groups, one in the early evening and another before sunrise, shall be observed on every night.

So far as I am aware, the only complete series thus arranged has been carried out simultaneously at Naples and Columbia College, New York. If the observations should realize the expectations of their accuracy, which preliminary reductions appear to justify, the whole combination should yield the most trustworthy value of the Aberration Constant yet determined.

The latitudes of both observatories are rather low for securing a very large co-efficient of aberration; on the other hand, in higher latitudes, a larger number of

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groups is required, because of the limitations in difference of R.A. between successive morning and evening groups on account of the long daylight during the summer months.

Loewy's beautiful method, as originally proposed, or as ingeniously modified by Comstock, when fully developed from the practical side, should offer the best independent means for determining the aberration-constant, because it is entirely independent of the effect of change of latitude. But for it, as for all new methods, exhaustive practical experiment is required before definitive results can be looked for, and both authors of these researches wisely regard their first applications of it in the light of preliminary research.

Newcomb, in his "*Astronomical Constants*," pages 137–139, has given a summary of the values of the aberration constant derived from different series of observations by various authorities, or as modified by himself to correct for the variation of latitude.

Briefly, he derives, from the Pulkowa observations generally, as the most probable value of the Aberration Constant :—

$$20''\cdot493 \textit{ mean error } \pm\ 0''\cdot011,$$

and from all other sources—

$$20''\cdot463 \textit{ mean error } \pm\ 0''\cdot013.$$

Chandler (*Astronomical Journal*, No. 298) discusses the Pulkowa observations independently

From the vertical-circle observations	...	20″·479.
„ „ prime-vertical observations	...	20″·507.

The velocity of light appears to be determined with all necessary precision. Newcomb (*loc. cit.*, page 147) concludes from his own determinations combined with those of Michelson

$$\textit{Velocity of light in vacuo}^{*} = 299860 \overset{\text{m.e.}}{\pm} 30 \text{ km. per second.}$$

But when it is proposed to derive the value of the Solar Parallax from observed values of the Constant of Aberration and the Velocity of Light, we are met by the question—"Is the generally accepted theory of Aberration demonstrably accurate?"

On the emission theory of light it is undoubtedly so, but I do not think it can be proved from the undulatory theory of light whether the sine of the observed value of the

* This result is in close agreement also with Cornu's determination of 1878, as re-discussed by Helmert, viz., 299990 km.

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Constant of Aberration is identical with the ratio of the mean orbital velocity of the Earth to that of the velocity of light, or is simply the principal term of a series expressing this ratio, of the other terms of which series we, at present, know nothing.

If this be so, the astronomer's duty is none the less clear, viz., to determine the Constant of Aberration with all possible precision, but until the physicist has proved that the theory of Aberration is unquestionably true, its observed constant should not be employed for the derivation of other astronomical constants.

If, however, we assume, for the moment, that the usual theory of Aberration is correct, and adopt Clarke's value (6378·2 k.m.), for the equatorial radius of the Earth, then, from our definitive result of the heliometer observations, we have—

$$\pi_0 = 8''\cdot802 \qquad \textit{probable error} \pm 0''\cdot005,$$

and from this we obtain with Newcomb's adopted light velocity,

$$\textit{the Constant of Aberration} = \mathbf{20''\cdot467} \qquad \textit{probable error} \pm 0''\cdot012,$$

a result which with our present knowledge of the observed value of the Constant is very nearly true, but which, for reasons above stated, cannot be accepted as a reliable determination.

The Light Equation.

If observations of the eclipses of Jupiter's satellites could be made with the necessary accuracy and freedom from systematic error, at widely differing distances of the Earth from Jupiter, then the known velocity of light *in vacuo* can be utilized for determining the dimensions of the Earth's orbit.

If, however, instead of observing the instant of last visibility, the instant is noted when the gradually diminishing light of the satellite under process of eclipse equals that of a non-eclipsed satellite, the brightness of whose image has been reduced by a known portion of its full amount, then it should be possible, by a series of such observations at each disappearance and at each re-appearance, and by comparison of the brightness of both satellites when both are uneclipsed, to determine the instant of true eclipse and true re-appearance (or rather the mean of these epochs) with very great accuracy and very little liability to systematic error.

The writer has had the pleasure of seeing at Paris a beautiful arrangement contrived by Cornu, by which the image of the satellite under eclipse and that of the satellite of comparison are juxtaposed, and the light of the satellite of comparison

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is reduced by a polarizing prism. The readings of the angle of rotation of the photometric prism are automatically recorded along with the instant of observation on the observer pressing an electric contact, so that the observations can be made with great certainty and rapidity. It is understood that these observations are being regularly prosecuted at Paris; and a somewhat similar series has long been in progress at Cambridge, U.S. under the direction of Professor Pickering.

The discussion of these observations will probably give final results of great weight and interest; meanwhile, they are not available. But a complete revision of the Tables of Jupiter's Satellites and especially an instrumental re-determination of the inclinations of the orbits of the satellites by independent methods are required before definitive results can be derived.

The only existing determinations of the Light-Equation are by Delambre (*Tables écliptiques des Satellites de Jupiter*, page vij), and by Glasenapp (in a Russian memoir, of which an account is given by Downing in *The Observatory*, pages 173 and 200).

The Light-Equation, or the time required for light to traverse the mean radius of the Earth's orbit, was found by—

Delambre, from 500 eclipses of the 1st Satellite	...	$493^{s}\cdot3$
Glasenapp, „ 391 „ „ „	(1) ...	$500\cdot84 \pm 1^{s}\cdot02$
„ „ „ „ „ „	(2) ...	$497\cdot15 \pm 1\cdot20$

(1.) Including corrections depending on the aperture of the telescope, the distance of the eclipsed satellite from Jupiter's limb, &c.

(2.) Without any corrections.

If we derive the Earth's mean distance from the Sun (from our value of $\pi_0 = 8''\cdot802 \pm 0''\cdot005$, and Clarke's value of the Equatorial Radius of the Earth 6378·2 km.) we get—

149,465,000 km. = 92,874,000 English miles.

and thence with the Newcomb-Michelson velocity of light—

The Light Equation = **$498^{s}\cdot46$** with the probable error $\pm 0^{s}\cdot28$.

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General Conclusions.

In the preceding discussion detailed criticism of other trigonometrical methods employed in determining the Solar Parallax has been avoided, because such criticism as has been omitted in the articles in *The Observatory* already quoted is amply supplied by Newcomb (*Astronomical Constants*, pages 154 and 164).

His general discussion of the value of π_0 from many different methods, excluding only that which he has derived from the mass of the Earth resulting from the secular variation of the orbits of the four inner planets (*loc. cit.*, page 158), is

$$\pi_0 = 8''\cdot800 \pm 0''\cdot004$$

This discussion is open to criticism because of the overwhelming weight given to the results depending on the determination of the constant of aberration.

Apart from the fact that the two results depending on aberration differ by more than the sum of the mean errors assigned to each of them, no allowance is made for the uncertainty of our knowledge of the theory of aberration, which uncertainty, strictly speaking, should exclude the results from the determination of π_0.

Considering also the liability to systematic error which at present exists, both on the practical and theoretical side, in the determination of π_0 based on the Parallactic Inequality of the Moon, an undue weight seems to have been given to that result.

Having regard to the systematic errors which now appear to be well proved to exist in the observations of limbs of discs, due to atmospheric chromatic dispersion and other causes, I should be inclined to attribute a much lower weight to the *Mars* heliometer observations and to other series involving the contact of limbs.

But variations of Newcomb's weights very slightly affect his mean result, and the latter is in very close accordance with that from the heliometer observations of *Victoria*, *Sappho* and *Iris*, viz. :—

$$\pi_0 = 8''\cdot802 \pm 0''\cdot005$$

So far as I have been able to determine, this last result is the one least open to systematic error.

There are however two points in Newcomb's conclusions which appear open to more serious criticism.

The first of these relates to the undue relative weight given to the determination of the Lunar Equation by meridian transits of the Sun, and the considerable error thereby introduced into the resulting mass of the Moon. Indeed, the method itself is feeble and unreliable, for reasons given at pp. 16 and 17, and the actual results confirm this view.

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The Constants of Precession and Nutation are well determined, the first for obvious reasons, and the second for reasons which are well stated by Newcomb (*loc. cit.*, page 129).

From these constants we can derive with considerable precision the value of the reciprocal of the Moon's mass, viz. :—

$$81{\cdot}80, \text{ or } 81{\cdot}50 \pm 0{\cdot}20,$$

according as we employ Chandler's or Newcomb's value of the Nutation Constant. The mean of these two results is in very exact agreement with the value derived from the heliometer observations, viz. :—

$$81{\cdot}702 \pm 0{\cdot}094.$$

But if we take the value of the Lunar Equation which Newcomb derives from meridian observations of the Sun ($P = 6''{\cdot}485 \pm 0{\cdot}018$) and his value of the Solar Parallax ($8''{\cdot}800 \pm 0{\cdot}004$) we get for the reciprocal of the Moon's mass—

$$81{\cdot}215$$

a result which is absolutely at variance with the above strong coincident values derived from independent and reliable data.

Or, finally, if we derive the value of the Solar Parallax from this determination of the Lunar Equation, combined with Newcomb's mass of the Moon (derived from the Nutation and Precession) we get—

$$\pi_0 = 8''{\cdot}853$$

a value which is quite at variance with all the other results.

It appears, therefore, that, compared with the *real* weight of the determinations of the Moon's mass—by the heliometer observations combined with the Luni-Solar Precession, and by the combination of the observed constant of Nutation with the Luni-Solar Precession—the *true* weight of the meridian determination of the Lunar Equation is very small, and should be regarded as practically zero.

The value of the solar parallax corresponding to the mass of the Earth derived by Newcomb from the secular variations of the orbits of the four inner planets, viz. :—

$$\pi_0 = 8''{\cdot}759 \pm 0''{\cdot}010,$$

viewed as a determination of the solar parallax, cannot, with the other evidence before us, be accepted as probably correct.

It is quite impossible to reconcile the heliometer observations of the minor planets with such a value of the parallax, unless we assume that the mean visible light of all these objects has a much lower refrangibility than the light of the comparison stars. But the heliometer method of observing affords so delicate a means of detecting such visual difference, especially after the observer's attention has been called to the matter, that it would apparently be impossible to overlook a mean difference of colour equal to one-fifth or even one-tenth of the difference between D and E. In observing *Victoria*

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and *Sappho* I frequently remarked "it is impossible for the observer to tell which is the planet and which the star, therefore he cannot be unconsciously influenced in making the pointings."

Farther, if the accepted theory of aberration be true, a value of $\pi_0 = 8''\cdot759$ would correspond with

$$20''\cdot57$$

for the constant of aberration, a value which is larger than that given by any of the 34 separate investigations of the constant quoted by Newcomb, except two, viz., that derived by Peters from Bradley's observations of γ Draconis at Greenwich, and that by Bessel from Bradley's Greenwich Right Ascensions. The 32 remaining modern and more refined results are quite conclusive against the possibility of accepting such a value. Therefore, either the usually accepted theory of aberration is wrong, or the value of the mass of the Earth deduced by Newcomb from the secular changes in the orbits of the four inner planets is affected by some unknown action or some defect of theory.

If with the value of the Earth's mass corresponding to $\pi_0 = 8''\cdot759$, *and with none other*, the whole of the planetary motions could be satisfied within probable, or even possible, errors of observation, then we should be compelled to admit that the presently accepted theory of aberration is erroneous, and to institute a new parallax-campaign of greater refinement, rejecting all our past methods as inefficient and useless, and as subject to systematic errors of which we know nothing.

But the fact remains that the planetary motions are not represented by theory, and that grave and difficult problems in astrodynamics still remain for solution. For the astrophysicist one of the most useful and immediately interesting researches would be a rigorous photometric comparison of the refrangibility of the mean visual light of *Iris*, *Victoria* and *Sappho* with that of the comparison stars actually employed. Probably, however, a test which has been suggested by Professor Auwers would be even more satisfactory, viz., to select stars of strongly marked colour with symmetrically situated comparison stars of normal colour, and observe them in opposite Hemispheres with means, and under conditions, similar to those of the observations of *Iris*, *Victoria* and *Sappho*. Should the results shew that the reduced positions of these *strongly coloured* stars are but slightly affected by large and opposite effects of refraction in opposite Hemispheres, the natural conclusion would be that the systematic errors of π_0 derived from observations of planets whose colour is *sensibly* the same as that of the comparison stars, would be quite insensible. It is proposed to carry out such a test.

Meanwhile, I venture to offer the following series of astronomical constants, which, as it appears to me, rests on the strongest data now available.

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Resulting Astronomical Constants.

From the Heliometer Observations only.

Reference Page.			Probable Error.
Part 6, p. 9.	Mean Horizontal Parallax of the Sun $= \pi_0 =$	$8''\cdot802$	$\pm\ 0''\cdot005$
Part 2, p. 537.	Constant of the Lunar Inequality $= \frac{M}{1+M}\pi_0 = \kappa$	$= 0\cdot10642$	$\pm\ 0\cdot00014$
Part 6, p. 10.	Ratio of the mass of the Moon to that of the Earth = M	$= \frac{1}{81\cdot702 \pm 0\cdot094}$	

Adopting the value of the Luni-Solar Precession from Newcomb's discussion (Astronomical Journal, No. 359) $p_0 = 50''\cdot367 \pm 0''\cdot004$ *we derive from combination with the above results—*

Part 6, p. 11.	The Constant of Nutation = N	$= 9''\cdot2068$	$\pm\ 0''\cdot0034$
" "	The Mechanical Ellipticity of the Earth $= \frac{C-A}{C}$	$= 0\cdot0032825$	$\pm\ 0\cdot0000025$
" "	Precession due to the Action of the Moon = P	$= 34''\cdot378$	$\pm\ 0''\cdot050$
" "	Precession due to the Action of the Sun = P′	$= 15''\cdot989$	$\pm\ 0''\cdot011$
" p. 12.	Parallactic Inequality of the Moon $= [1\cdot16242]\frac{1-M}{1+M}\pi(1+n)$*	$= I = (124''\cdot84 \pm 0''\cdot07)(1+n)$*	

Adopting Clarke's Equatorial Radius of the Earth = 6378249 metres, *and the Newcomb-Michelson Velocity of Light per sec.* = 299860 ± 30 km., we get—

Part 6, p. 23.	The Mean Distance of the Earth from the Sun	= 149,465,000 km.
" "	The Light Equation	$= 498^s\cdot46 \pm 0^s\cdot28$

and, if the accepted theory of Aberration be true,

Part 6, p. 22.	The Constant of Aberration	$= 20''\cdot467 \pm 0''\cdot012$

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* Where $(1 + n)$ is the quantity, not yet determined, by which Hansen's numerical co-efficient should be multiplied, as foreshadowed by the researches of Hill and Brown. (*See* Part 6, p. 12.)

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Note on the Elements of Victoria by Dr. H. Lange.

The elements used in the computation of the ephemeris in A.N. 2931 were deduced by Dr. Knopf from nine normal places from 1874—1888.

The representation of these places by the corrected elements is as follows :—

Berlin Midnight.	dG	dg
	″	″
1874 March 21	− 3·50	+ 0·50
1875 October 2	+ 5·06	+ 1·34
1878 May 17	+ 3·14	− 2·11
1879 December 2	− 1·81	− 0·56
1881 February 27	− 7·40	+ 1·75
1882 August 13	− 1·42	− 1·81
1882 September 6	− 2·56	− 0·10
1884 January 21	− 0·10	− 0·46
1888 February 5*	+ 8·92	− 1·56

According to this solution the probable error of μ is

$$\pm\ 0''\cdot0005907$$

and, consequently, the uncertainty in the value of log a might amount to two units in the seventh decimal place.

The perturbations employed were taken from Brünnow's Tables.

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* The normal place on 1888 Feb. 5 depends only on two observations by Prof. Knorre, which give the following differences when compared with the *Berliner Jahrbuch* :—

	$\Delta\alpha$	p	$\Delta\delta$	Authority for Comparison Star.
	s		″	
1888 Feb. 4	− 6·29	1	+ 21·3	α Communicated by Knorre ; δ Küstner, Merid. Obs.
Feb. 6	− 6·41	2	+ 21·8	Küstner, Merid. Obs.
	Obs.	−	Comp.	

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On the Computation of the Orbit of Sappho by First-Lieutenant Von der Pröben.

On the basis of Bryant's elements, the perturbations by *Jupiter* and *Saturn* were computed backwards from 1872 September 7·0 to 1863 December 4·0.

For the perturbations by *Mars*, the *Earth*, and *Venus*, Bryant's values were employed.

Thus for the period 1864 to 1871 the seven new normals were deduced for the following epochs :—

1864 May	22·0	from	7	observations.	
1865 December	13·0	„	8	„	
1867 April	7·0	„	5	„	
1868 August	29·0	„	7	„	
1868 September	12·0	from	6	observations.	
1870 February	20·0	„	4	„	
1871 May	20·0	„	9	„	

The improvement of the orbit from these normal places gave a satisfactory representation of them, viz.:

SYSTEM A.

	dG	dg
	′	′
1864	+ 0·5	− 0·1
1865	− 0·9	− 0·3
1867	− 2·4	− 1·2
1868 I.	− 0·7	+ 1·2
1868 II.	+ 1·6	− 1·3
1870	+ 0·9	+ 1·2
1871	− 0·6	− 0·1

Then five new normal places were deduced for the period 1875—1888, viz.:

1875 September	22·0	from	8	observations.	
1878 June	6·0	„	4	„	
1882 October	5·0	„	8	„	
1887 January	20·0	from	8	observations.	
1888 April	16·0	„	13	„	

The first three of these were next combined with the previous normals, and thus an improved system B was formed, from which the two last normal places, in 1887 and 1888, shewed considerable discordances ($dG = 42''$).

This fact led to a re-computation of the perturbations by *Jupiter* from 1877 July 3 to 1888 March 27, according to which Bryant's calculations proved to be in error. The attempt, however, to include the last two normal places, with the help of the new *Jupiter*-perturbations, did not yet lead to a satisfactory result.

After three new normal places had been obtained from the year 1889, viz., on September 20·5, October 10·5, and October 30·5, an improvement to the orbit was undertaken from the whole 15 normal places (1864—1889), taking into account the perturbations by *Jupiter*, *Saturn* and *Mars* only. For this purpose the perturbations

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by these three planets were computed beforehand, and in addition those by the *Earth* and *Venus* from 1888 March 27 to 1889 October 8.

The representation of the normal places by the elements thus obtained was as follows :—

SYSTEM B.

1864	$dG = -6'\cdot6$	1870	$dG = +0'\cdot3$	1887	$dG = +7'\cdot1$
1865	$-3\cdot8$	1871	$-1\cdot3$	1888	$+7\cdot1$
1867	$-7\cdot1$	1875	$-0\cdot9$	1889 I.	$-1\cdot94$
1868 I.	$+3\cdot6$	1878	$+1\cdot9$	1889 II.	$-0\cdot84$
1868 II.	$+6\cdot0$	1882	$-4\cdot9$	1889 III.	$-0\cdot15$

A comparison of these results with the previous ones shewed that the *Earth*- and *Venus*-perturbations could not be neglected.

A re-computation, therefore, of the perturbations by the *Earth* was commenced, which shewed that between 1875 March 16 and 1876 August 17 an error had occurred in Bryant's work.

After the elimination of this error (the remainder of Bryant's values for the Earth-perturbations being retained) there resulted a new definitive correction to the orbit, taking into account perturbations by the *Earth* and *Venus*.

The normal places were now well represented, viz. :

SYSTEM C.

1864	$dG = +0'\cdot2$	1870	$dG = +2'\cdot1$	1887	$dG = -0'\cdot7$
1865	$0\cdot0$	1871	$+0\cdot4$	1888	$+1\cdot1$
1867	$-2\cdot0$	1875	$-1\cdot8$	1889 I.	$-0\cdot07$
1868 I.	$0\cdot0$	1878	$0\cdot0$	1889 II.	$+0\cdot55$
1868 II.	$+2\cdot5$	1882	$-0\cdot9$	1889 III.	$+0\cdot64$

Elements of the planet (80) *Sappho* deduced from 15 normal places between the years 1864—1889, taking into account the perturbations by *Venus*, the *Earth*, *Mars*, *Jupiter* and *Saturn*.

SYSTEM C. EQUINOX 1889·0.

T	1889 Sept. 18·0	1889 Oct. 8·0	1889 Oct. 28·0
	° ′ ″	° ′ ″	° ′ ″
M	8 6 33·06	13 46 27·88	19 26 22·89
ω	136 58 38·81	136 58 47·74	136 58 55·59
☊	218 33 28·85	218 33 28·80	218 33 28·84
i	8 37 19·84	8 37 19·85	8 37 19·84
φ	11 32 55·66	11 32 55·29	11 32 55·57
μ	1020″·0283	1020″·0285	1020″·0219
log a	0·3609296	0·3609295	0·3609314

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